

Service Manual

and Technical Guide

Telephone Equipment

3-2
Supplement-4

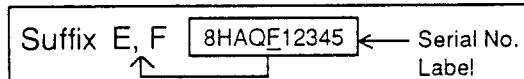
AUTO-LOGIC™
EASA-PHONE®
Integrated Telephone
Answering System

KX-T2470
KX-T2475

- Please use this manual together with the service manual for model No. KX-T2470, order No. KM49006227C1.
- Please use this manual together with the service manual for model No. KX-T2475, order No. KM49009267A1.

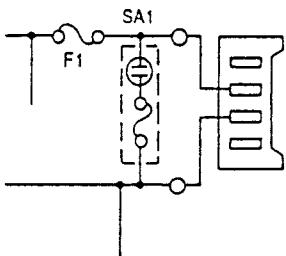
CHANGES

(KX-T2470, KX-T2475)

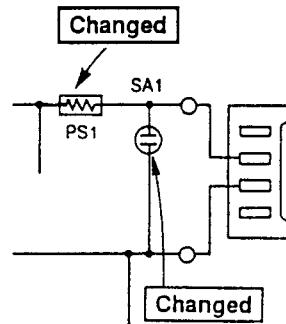


	Suffix	The reason for suffix change
1	D→E	Improve performance of cassette deck.
2	E→F	Improve performance of Interface circuit.

■ SCHEMATIC DIAGRAM



(Supplement-1)

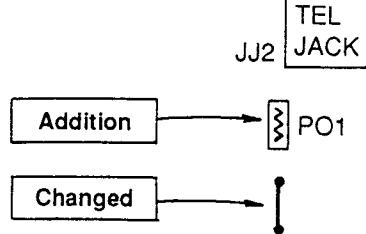


(Supplement-4)

■ CIRCUIT BOARD



(Supplement-2)



(Supplement-4)

Panasonic

■ PARTS COMPARISON TABLE

Reason for Change		The circled item indicates the reason. If no marking, see the Notes in the bottom Column.					
1. Improve performance							
2. Change of material or dimension							
3. To meet approved specification							
4. Standardization							
5. Addition							
6. Deletion							
7. Correction							
8. Other							
Interchangeability Code		*The circled item indicates the interchangeability. If no marking, see the Notes in the bottom column.					
Parts	Set Production						
A Original New	→ Early → Late	Original or new parts may be used in early or late production set. Use original parts until exhausted, then stock new parts.					
B Original New	→ Early → Late	Original may be used in early production sets only. New parts may be used in early or production sets. Use original parts where possible, then stock new parts.					
C Original New	→ Early → Late	New parts only may be used in early or late production sets. Stock new parts.					
D Original New	→ Early → Late	Original parts may be used in early production sets only. New parts may be used in late production sets only. Stock both original and new parts.					
E Other							
Ref. No.	Part No.	Part Name & Description			Pcs/ Set	Note 1	Note 2
	Original Parts	New Parts					Time of Change(Suffix)
MECHANICAL PARTS							
M 7	PQFD9914Y	PQFD9919Z	Operation Plate	1	1*	1 D	Mid of E
M10	PQFG9906Z	PQFG9906Y	Cam Gear Assembly	1		1 B	E
M11	PQFI1007Z	PQFI1012Z	Pinch Roller	2		1 B	Mid of D
M22	PQFC9912Z	PQFC9911Z	Mechanism Base Assembly	1		1 A	Mid of D
M23	PQFR9919Y	PQFR9919X	Rewind Arm Assembly	1		1 B	Mid of D
M33	PQFS118Z	PQFS118Y	Spring, Rew Arm	1		1 B	Mid of D
M36	PQFS86Z	PQFS140Z	Spring, Plunger-A (Change 1)	1		1 B	Mid of D
M36	PQFS140Z	PQFS86Z	Spring, Plunger-A (Change 2)	1	1*	1 D	Mid of E
M38	PQFS88Z	PQFS88Y	Spring, Play Arm	2		1 B	Mid of D
M41	PQFW52Z	PQFW10001Z	Head Base	1	1*	1 D	Mid of E
SWITCHES							
S301-313,320 ,321,328,329	EVQ12405K	EVQ22405K	Switch, OGM Play FF, REW etc.	21		1 A	Mid of D
OTHERS							
SA1	PQVDDSV301LA	PQVDSAE310F1	Varistor (Surge Absorber)	1		1 D	F
X301	PQVCL3276N6Z	PQVCL3276N9Z	Crystal Oscillator	1		1 A	Mid of E
F 1	PQBA1N02NMAL	—	Fuse (125V, 200mA)	0		6	F
P01	—	PQRPBC120N	Thermistor, 12Ω	1		5	F
ACCESSORY							
A 4	PQJN1P15AZ	PQJN1P15AV	Cassette Tape	1		1 A	Mid of D
PACKING MATERIALS							
P 3	PQPN1142Z	PQPN1142Y	Accessory Box	1		1 A	Mid of E
P 4	XZB34X40A1	PQPP171Z	Protection Cover (for Set)	1		1 B	Mid of D
RESISTORS							
R38	PQ4R18XJ103	PQ4R18XJ472	Resistor, 4.7kΩ	1		1 A	Mid of E
R52	ERDS2TJ393	PQ4R18XJ393	Resistor, 39kΩ	1		1 A	Mid of D
R64	PQ4R18XJ2R2	—	Resistor, 2.2Ω	0		6	Mid of D
R72	PQ4R18XJ683	ERDS2TJ683	Resistor, 68kΩ	1		1 A	Mid of D
CAPACITORS							
C10	ECEA1AU221	ECEA1CU221	Capacitor, 220μF	1		1 D	F
C25	ECEA1HKS0R1	ECEA1HKS22	Capacitor, 0.22μF	1		1 A	Mid of E
C68	ECEA0JK221	ECEA1CK101	Capacitor, 100μF	1		1 A	Mid of D
C69	PQCB1C103MY	—	Capacitor, 0.01μF	0		6	Mid of D
C107	ECEA0JK221	—	Capacitor, 220μF	0		6	Mid of D
C189	PQCUV1E104ZF	PQCUV1E104MD	Capacitor, 0.1μF	1		1 A	Mid of F

Note: Parts with mark 1* has been changed at the same time. (Nov. 1991)

Service Manual

and Technical Guide

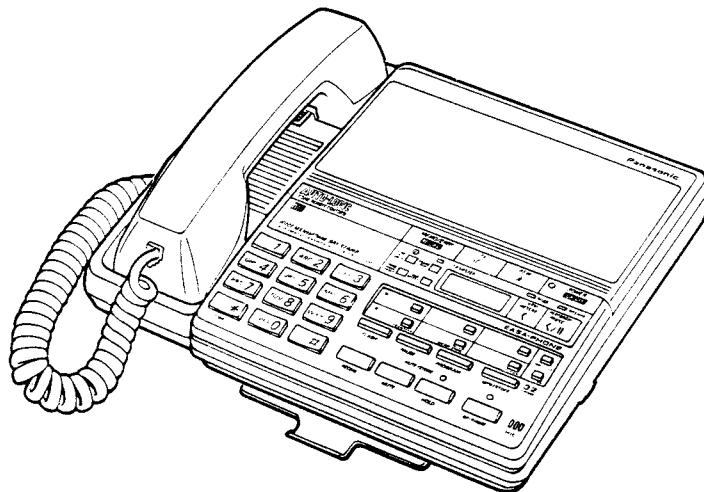
AUTO-LOGIC™

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Integrated Telephone
Answering System

Telephone Equipment

KX-T2470



SPECIFICATIONS

General:

Power Source: AC; AC adaptor KX-A11-W (DC 12 V)

Power Output: 350 mW (max.)

Speaker: Unit; 5 cm (1³¹/₃₂) PM dynamic
Handset; 2.6 cm (1³/₁₆) PM magnetic type

Microphone: Condenser microphone

Jacks: Telephone line, DC IN

Dimensions: 9¹⁹/₃₂"×8⁷/₈"×3¹⁵/₁₆"
[244 (W)×225 (D)×100 (H)] mm (with handset)

Weight: 0.94 kg (2 lb 1.16 oz) without cassette tapes

Telephone Section:

Memory Capacity: 26 telephone numbers, up to 16 digits for
each station

Dial Speed: Tone (DTMF)/Pulse (10 pps)

Redial: Last dialed telephone number up to 15
times in 10 minute period

Pause: Two automatic dial tone detectors

Tape Deck Section:

Outgoing Message
(OGM): Recorded on a microchip.
Recording Time is 30 seconds.

Incoming Message
(ICM): Micro Cassette (MC-30) (1 MIN/VOX/A0)

Tape Speed: 2.4 cm/s

Wow and Flutter: 0.58% (WRMS)

Motor: Electrical governor motor

Design and specifications are subject to change without notice.

Panasonic

Matsushita Services Company
Division of Matsushita Electric
Corporation of America
50 Meadowland Parkway,
Secaucus, New Jersey 07094

Matsushita Electric
of Canada Limited
5770 Ambler Drive, Mississauga,
Ontario, L4W 2T3

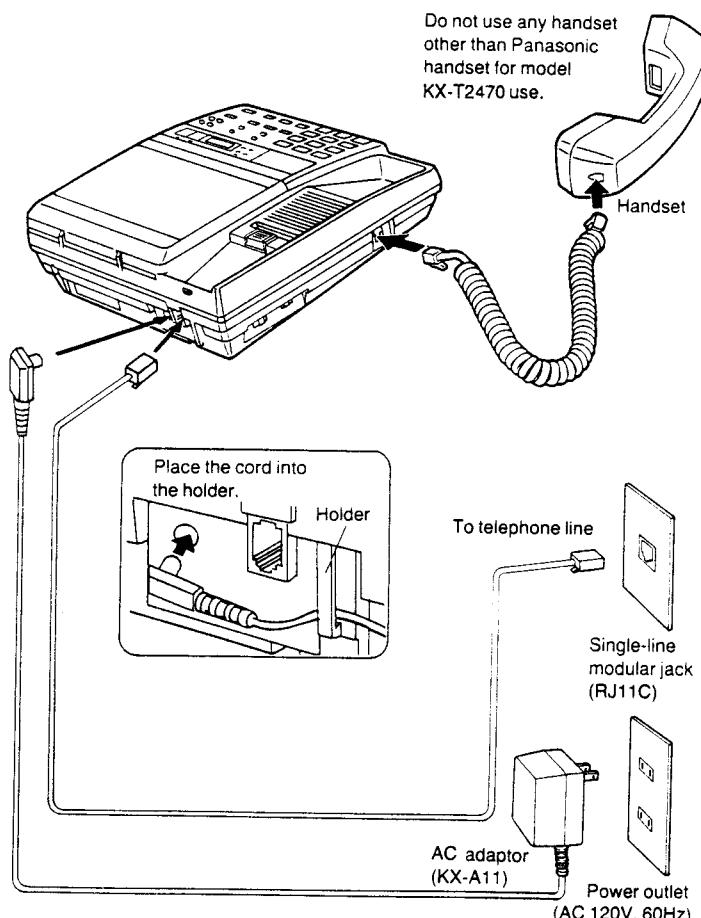
Panasonic Sales Company,
Division of Matsushita Electric
of Puerto Rico, Inc.
San Gabriel Industrial Park
65th Infantry Ave, Km.9.5
Carolina, Puerto Rico 00630

When you mention the serial number, write down the 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

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CONNECTION



- Be sure to insert the tapes before connecting the AC adaptor.
- **USE ONLY Panasonic AC ADAPTOR KX-A11.** If a power failure takes place, the unit can be used as a typical telephone.
- The unit will automatically turn itself on 3 minutes after the AC adaptor is connected.
- While operating the unit, the case of the AC adaptor may feel warm. This is a normal condition.

Fig. 1

LOCATION OF CONTROLS

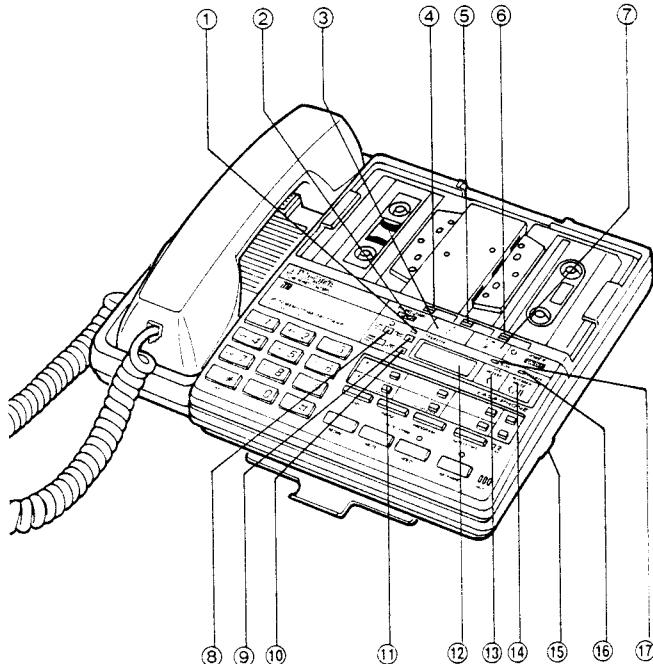


Fig. 2

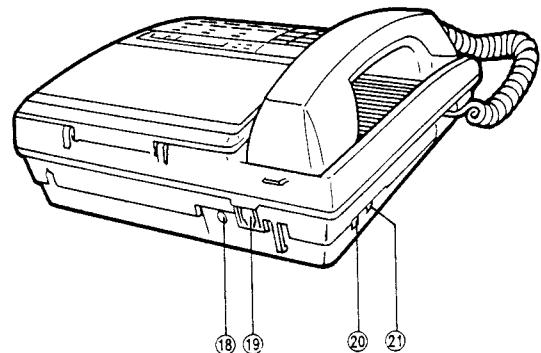


Fig. 3

- ① TRANSFER indicator
Lights when you set the transfer mode.
Flashes ... when the unit is resetting the OGM tape.
- ② MEMO/2 WAY button
Used to record a message memo or a telephone conversation.
- ③ FF (Fast forward) button
Used to fast forward the Incoming Message cassette tape.
- ④ OGM REC (Recording) button
Used to record the Outgoing Message.
- ⑤ OGM PLAY button
Used to play the recorded Outgoing Message.
- ⑥ ICM ERASE button
Used to erase the recorded Incoming Messages.
- ⑦ REW (Rewind) button
Used to rewind the Incoming Message cassette tape.
- ⑧ TIME DAY CHECK button
Used to announce the day and time.
- ⑨ Transfer (TRANS.) OGM button
Used to select the Transfer OGM mode.
- ⑩ OGM SELECT button
Used to select OGM mode 1 or 2. The display indicates the selected OGM.
While the OGM tape is rewinding or forwarding, the selected OGM's indication on the display will flash.
- ⑪ TRANSFER button
This is the memory station for storing the transfer telephone number.
- ⑫ Liquid Crystal Display
- ⑬ NEW MESSAGE button
Used to play back the newly recorded messages.
- ⑭ PLAYBACK/PAUSE button
Used to play back the recorded Incoming Messages and to stop the ICM tape temporarily during ICM playback.
- ⑮ Volume selector
- ⑯ ANSWER indicator
- ⑰ IN USE indicator
- ⑱ AC Jack (Power)
- ⑲ Telephone line jack
- ⑳ Ringer volume selector
- ㉑ Dialing mode selector
Used to change the dialing mode tone/pulse.

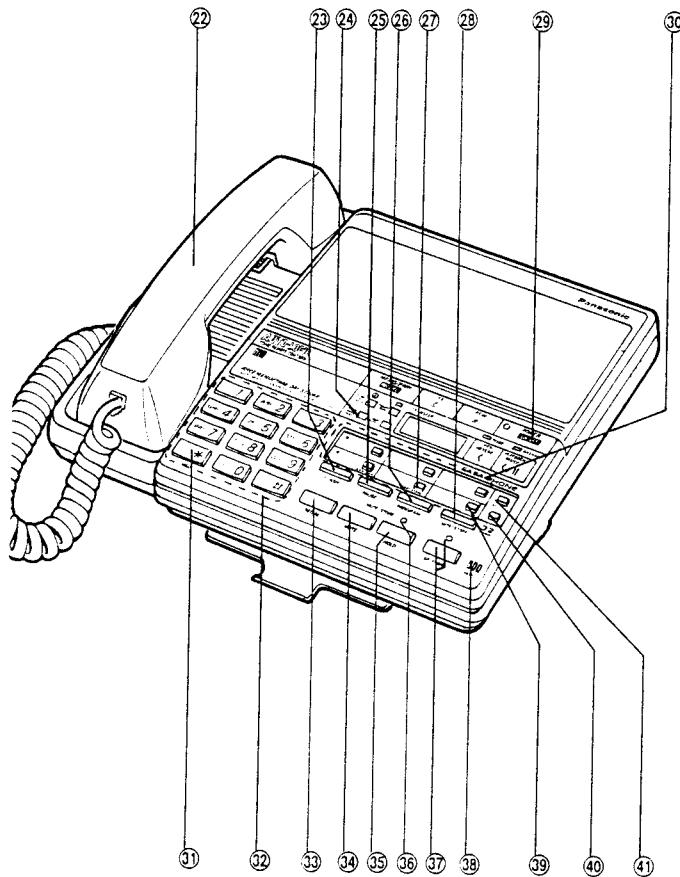


Fig. 4

(22) Handset	(31) TONE button Used to change from pulse dialing mode to tone dialing mode while dialing.
(23) FLASH button Used to access some of the features of your host PBX.	(32) Dial key pads Used to dial or program phone numbers.
(24) VOICE MEMO CHECK button Used to confirm the stored telephone numbers in the memory stations.	(33) REDIAL button Used to redial the last dialed phone number.
(25) PAUSE button Used to enter a pause in phone numbers when programming or dialing.	(34) MUTE button Used when you do not want your voice to be heard by the other party. The voice of the calling party will still be heard.
(26) PROGRAM button Used to start and complete the programming procedures.	(35) HOLD button Used to put the calling party on hold during a conversation. While holding, the HOLD indicator flashes.
(27) SECRET STORE button Used to store the secret telephone numbers into memory. This button is also used as a direct call station button.	(36) MUTE/STORE (HOLD) indicator
(28) AUTO/STORE button Used to program phone numbers and settings into memory.	(37) SP-PHONE button and indicator
(29) POWER ON/OFF button and indicator Used to turn on and off the unit. The indicator lights when the unit is turned on.	(38) Microphone (MIC)
(30) Direct call buttons Used to store phone numbers and to make calls using one-touch dialing easily.	(39) CLEAR button Used to correct the telephone number while storing.
	(40) LOWER button Used to select the lower memory locations.
	(41) TIME Adjust (ADJ.) button Used to set the time and day.

DISASSEMBLY INSTRUCTIONS

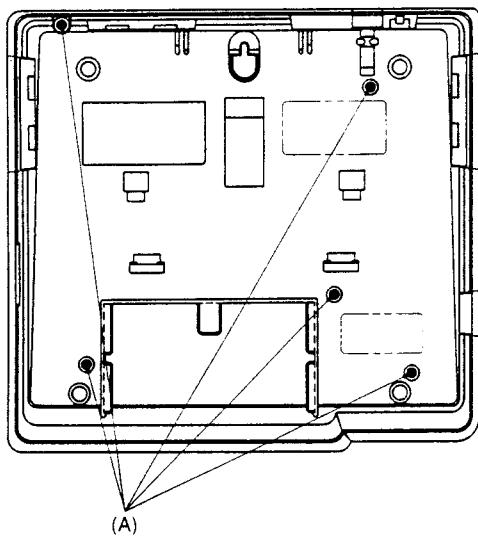


Fig. 5

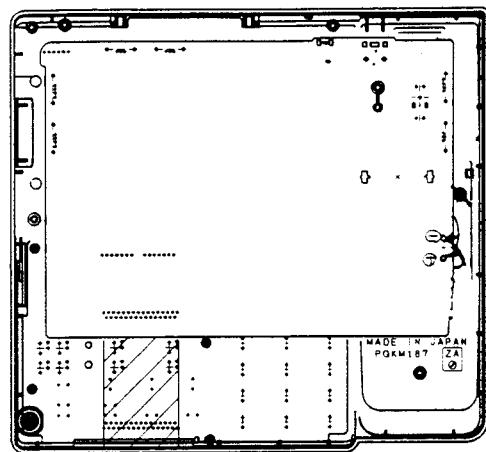


Fig. 6

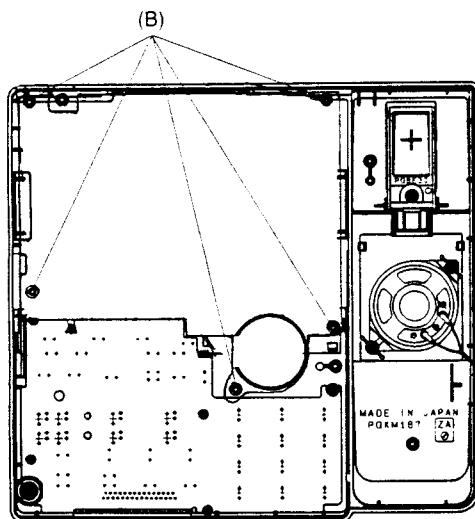


Fig. 7

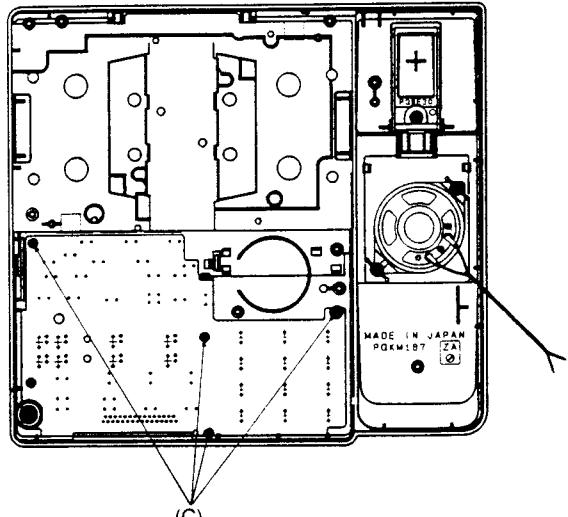
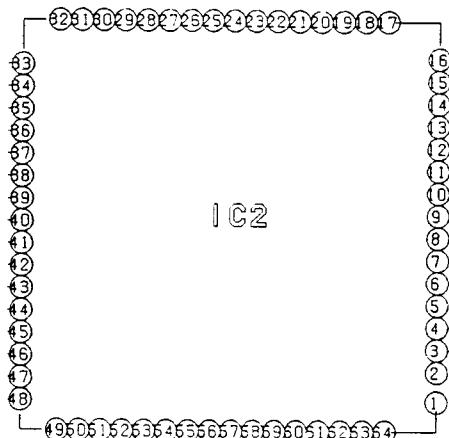


Fig. 8

Ref. No.	Procedure	Shown in Fig.—	To remove—	Remove—
1	1	5	Lower Cabinet	Screws (3×16) (A)×5
2	1, 2	6	Main Printed Circuit Board	Remove the Main Printed Circuit Board
3	1~3	7	Cassette Deck	Screws (3×10) (B)×5
4	1~4	8	Sub Printed Circuit Board	Screws (3×10) (C)×4

CPU DATA

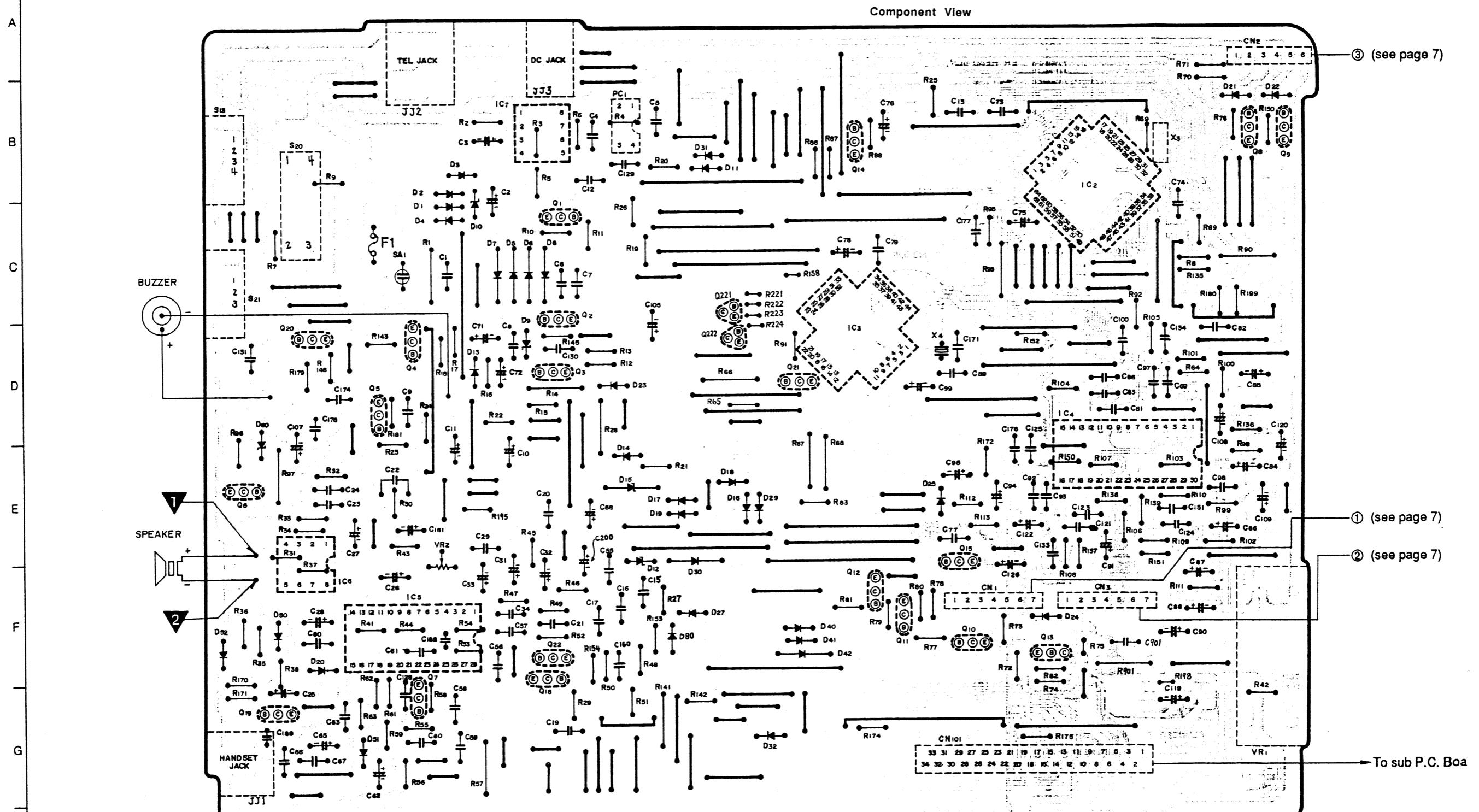


Par No.: PQVI4678A06H
 Power Supply: 4.5V~5.5V
 Program ROM: 8K X 10 bit
 Inside Data RAM: 512 x 4 bit

Pin No.	Function	High	Low	Pin No.	Function	High	Low
1	Strobe-Data			33	AC Down		AC Down
2	Strobe-Data			34	BELL		Bell
3	Strobe-Data			35	CPC		
4	Strobe-Data			36	PL-C		ON
5	Key Input			37	M-SPEED	High	Low
6	Key Input			38	PL-B		
7	Key Input			39	PL-A	ON	
8	Key Input			40	MOTOR		
9	ITS SCK			41	ERASE	Active	
10	ITS SO			42	RVN(OGM)		
11	ITS SI			43	RVN(ICM)		
12	ITS Busy			44	Position SW	Newtral	Active
13	C0			45	Vox	No Voice	Vox
14	C1			46	Vcc		
15	C2			47	SP OUT	Active	
16	C3			48	SP MUTE	Mute	Out
17	NC			49	ICM/OGM		
18	NC			50	PLAY/REC		
19	Beep-L			51	MIC		
20	Beep-S			52	L IN		
21	Reset			53	REC		
22	GND			54	L OUT		
23	OSC1			55	A Vcc		
24	OSC2			56	A in (-)		
25	TEST			57	A in (+)		
26	IN USE			58	GC		
27	Answer			59	V ref		
28	Power			60	A Gnd		
29	Transfer			61	VG Start		
30	TR			62	C5		
31	ITS TEST			63	VG Busy		
32	TAM TEST			64	C4		
		ON					
		TEST					
		TEST					

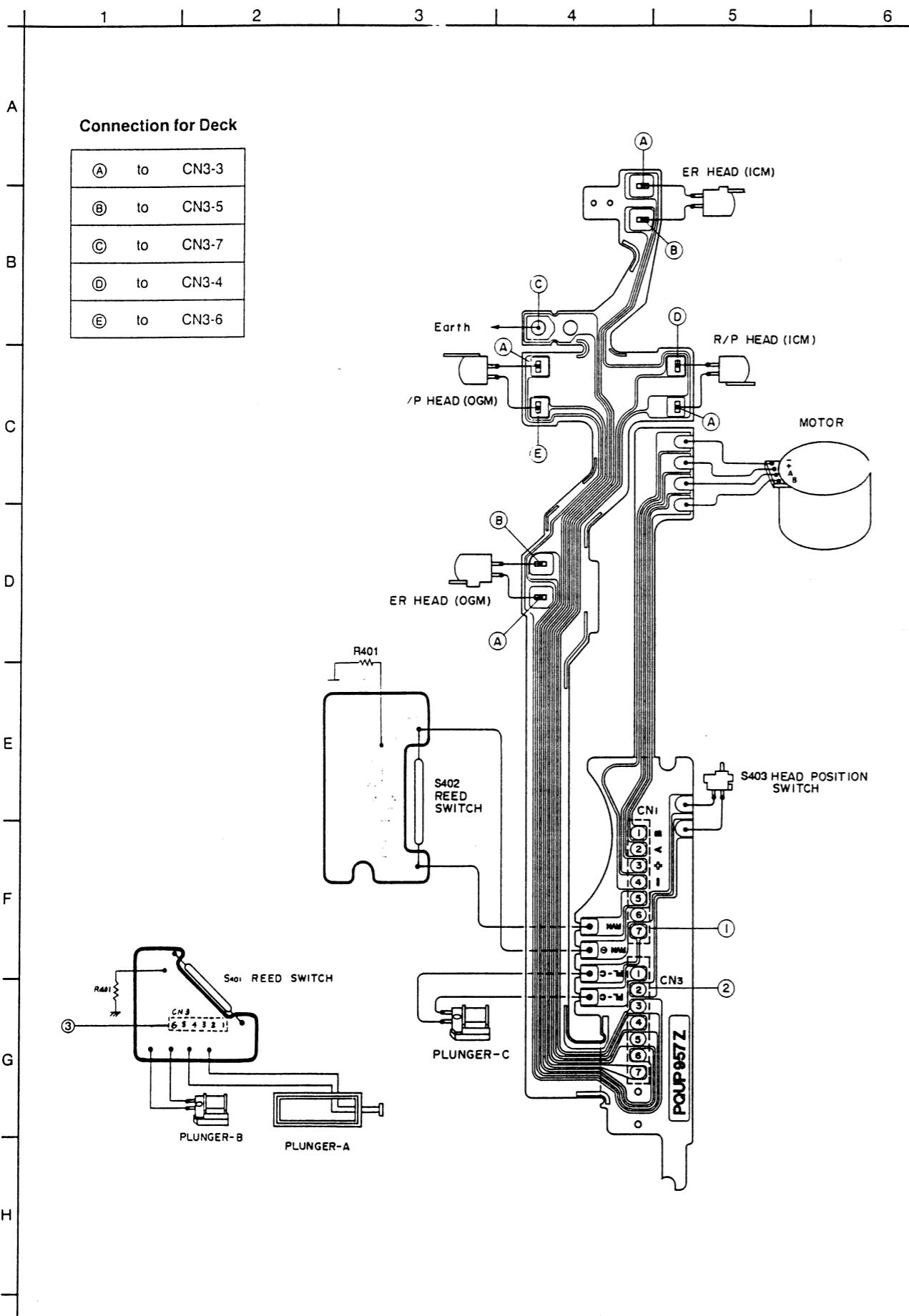
CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (MAIN)

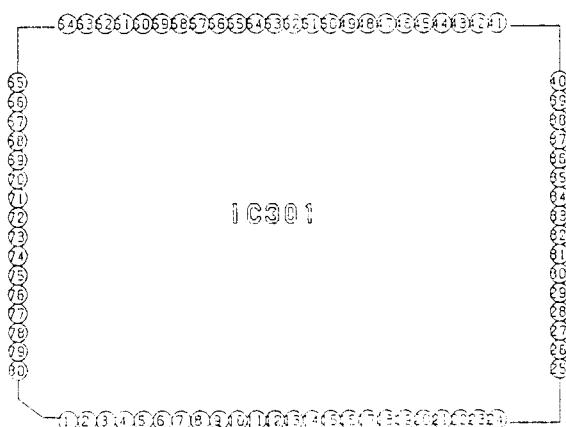
1 2 3 4 5 6 7 8 9 10 11 12

**Note:**

This circuit board may be modified at any time with the development of new technology.

DECK CONNECTION





Par No.: PQVI4608A61F
 Power Supply: 2.7V~6.0V
 Program ROM: 8K
 Inside Data RAM: 1.184 x 4 bit

Pin No.	Function	High	Low	Pin No.	Function	High	Low
1	Power Down	Power On	Power Down	31	Hook SW	ON-Hook	OFF-Hook
2	DP	Break	Make (H-imp)	32	EX-Hook	OFF-Hook	ON-Hook
3	Strobe			33~54	Not Used		
4	Strobe			55	SEG 23		
5	Strobe			56	SEG 24		
6	Strobe	Usual	Active	57	SEG 25		
7	Strobe			58	SEG 26		
8	Strobe			59	SEG 27		
9	Option Input			60	SEG 28		
10	Option Input			61	SEG 29		
11	Tone Input	Disable	Enable	62	SEG 30		
12	Stop Input	Stop	Usual	63	SEG 31		
13	Test	Usual		64	SEG 32		
14	X1			65	COM 1		
15	X2			66	COM 2		
16	GND		0V	67	COM 3		
17	Serial Clock	Usual	Active	68	COM 4		
18	Serial Input			69	V 1		
19	Serial Output			70	V 2		
20	Serial Busy			71	V 3		
21	Key-Input			72	Tonec		
22	Key-Input			73	Toner		
23	Key-Input			74	V ref		
24	Key-Input			75	Vcc	5 V	
25	TR	Hold	Release	76	System Clock		
26	SP/HS	SP-Phone	Handset	77	System Clock		
27	Mic Mute	ON	OFF	78	Reset	Reset	Usual
28	SP Mute	ON	OFF	79	Mute LED	OFF	ON
29	Not Used			80	ON/OFF LED	OFF	ON

BLOCK DIAGRAM

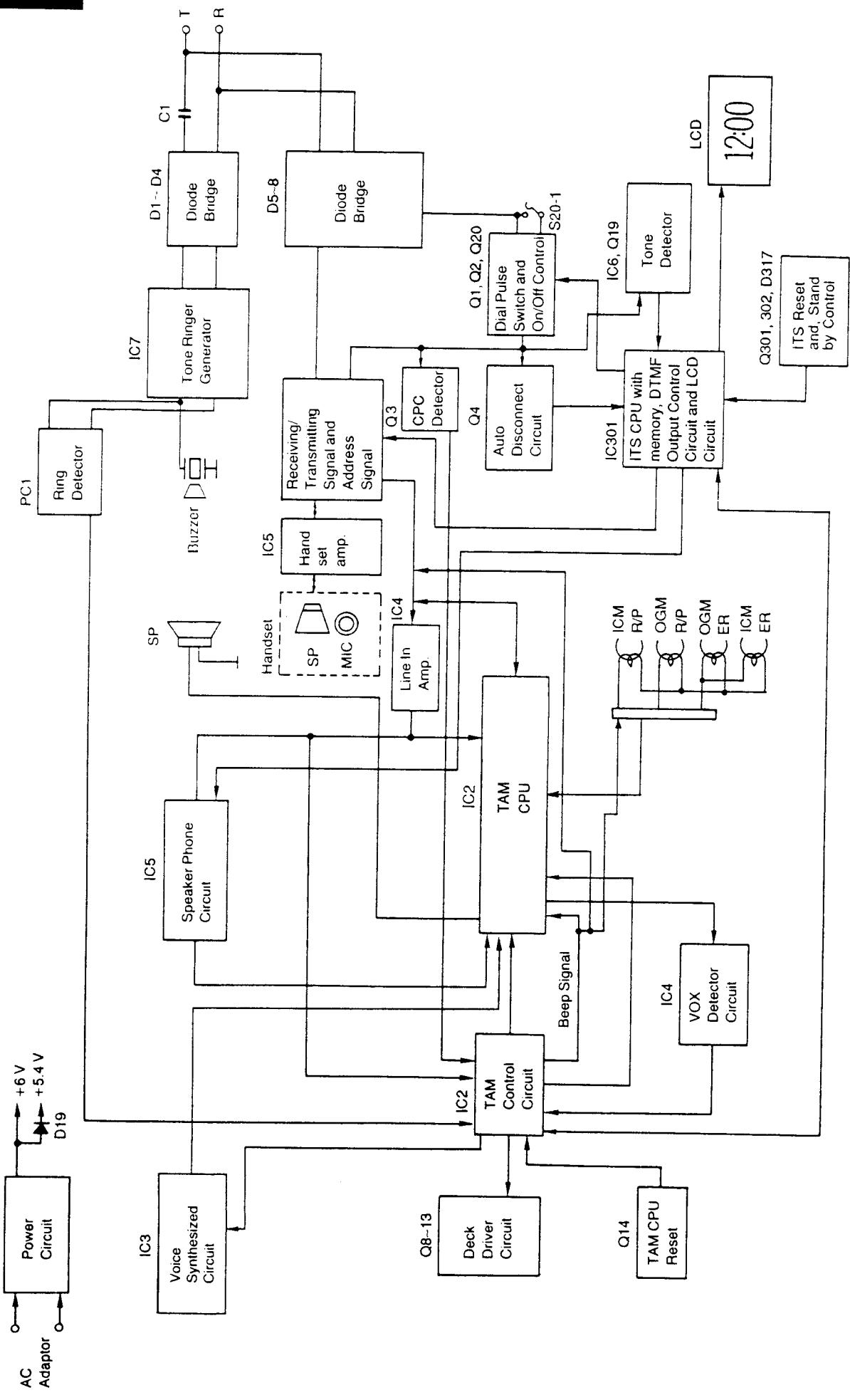


Fig. 9

MEASUREMENT AND ADJUSTMENT METHOD

Notes:

1. Make sure the heads are clean.
2. Make sure the capstan and pressure roller are clean.
3. Room temperature for measuring and adjusting: $20 \pm 5^\circ\text{C}$ ($68 \pm 9^\circ\text{F}$)
4. Test equipments are not treated as replacement parts.

ITEM	MEASUREMENT & ADJUSTMENT ¹	REMARKS
Head azimuth adjustment	<p>A. Record/playback head for incoming message cassette</p> <ol style="list-style-type: none"> 1. Playback test tape (QZZCWAT 3 kHz) 2. Adjust screw (A) shown in fig. B for maximum output at SP terminal. <p>(Test equipment connection is shown below.)</p> <p>Fig. A</p> <p>Test tape Playback mode VTVM Oscilloscope</p> <p>B. Record/Playback head for outgoing message cassette</p> <ol style="list-style-type: none"> 1. Playback test tape (PQJN17Z 3 kHz) 2. Adjust screw (A) shown in fig. B for maximum output at SP terminal. <p>(Test equipment connection is shown in fig. A)</p> <p>Fig. B</p>	<p>- Record/playback head for incoming message and outgoing message.</p>

Note: Perform the following adjustment after replacing IC5 and VR2.

Test Equipment:
Loop Simulator
RC Oscillator
VTVM
Preparation:
<ol style="list-style-type: none"> 1. Set the unit's controls as follows: <ol style="list-style-type: none"> A. SP-PHONE SWITCH—"ON" B. VOLUME CONTROL—"MAX" 2. Connect the AC Adaptor. 3. Set the variable resistor of the loop simulator to maximum resistance (fully counterclockwise). 4. Connect the unit to the loop simulator. 5. Push the Mute button. (S320) 6. Make adjustment in a quiet room.
Reception Level:
<ol style="list-style-type: none"> 1. Set the loop simulator selector switch to "RX". 2. Set RC Oscillator to 1 kHz, -40 dBm with a VTVM. 3. Connect the VTVM to Test Points ∇ (-) - ∇ (+). 4. Adjust VR2 for a reading of $-16.5 \text{ dBm} \pm 0.5 \text{ dBm}$ on the VTVM.

TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES

PQVIBA8250 AN6562	AN6181K	PQVI4678A06H	PQVISC79054A	PQVI4608A61F
PQVTKSD261CY 2SA1625 2SC2120	2SD2136	2SD1819A 2SB1218A	2SC1740S 2SA933	2SD662B
				Cathode Anode MA165 PQVDSLZ5688G 1SS119 1S2076 P0VD05AZ6R2 PQVDHZ3BLL PQVDMTZ6R8
DTC144A POVTDTA124E 2SD1994A	LN221RPH	PQVDSLZ155B1	MA165 PQVDSLZ5688G 1SS119 1S2076 P0VD05AZ6R2 PQVDHZ3BLL PQVDMTZ6R8	
MA4300 MA4180 MA4062	PQVDSLZ190B1			

Please refer to the Circuit Board and wiring Connection Diagram which is located at the test points (▼).

Schematic Diagram of Loop Simulator

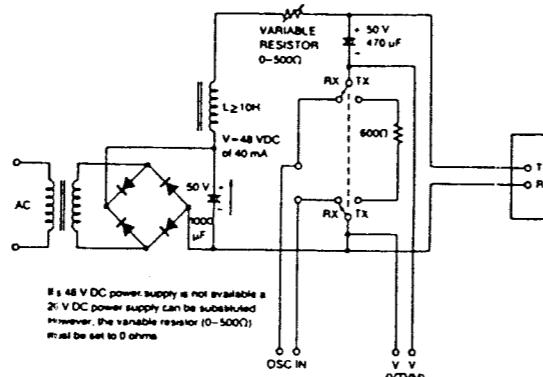


Fig. 10

EXTENSION CORD CONNECTING METHOD

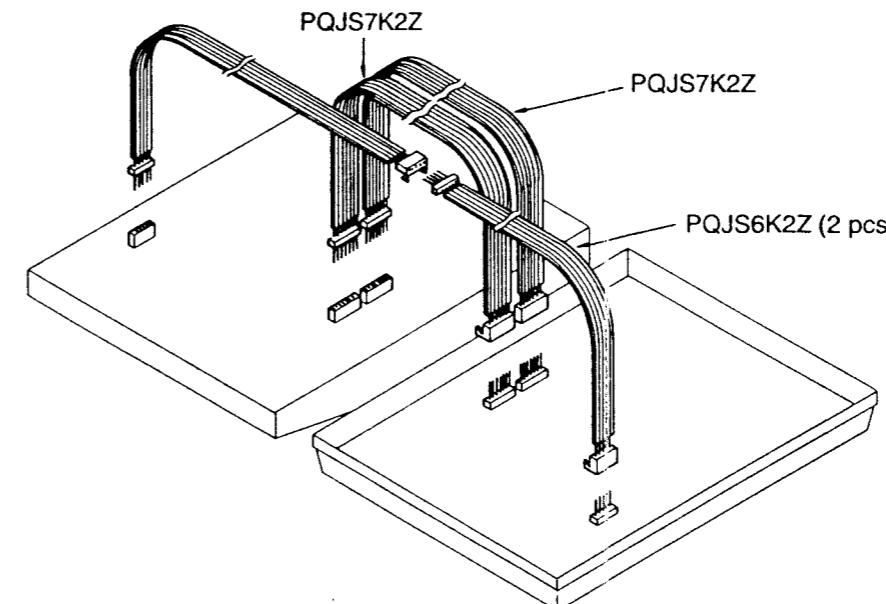
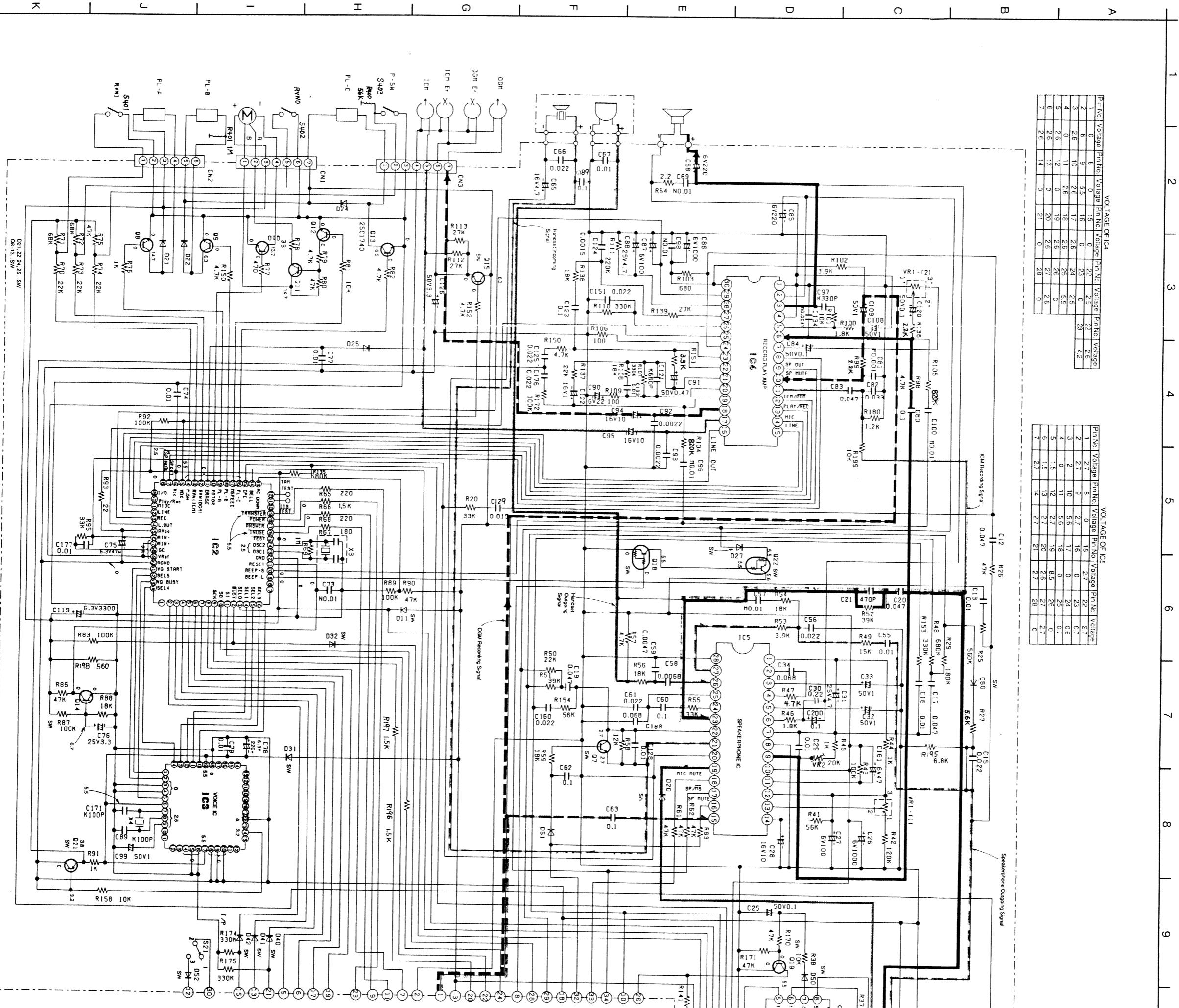


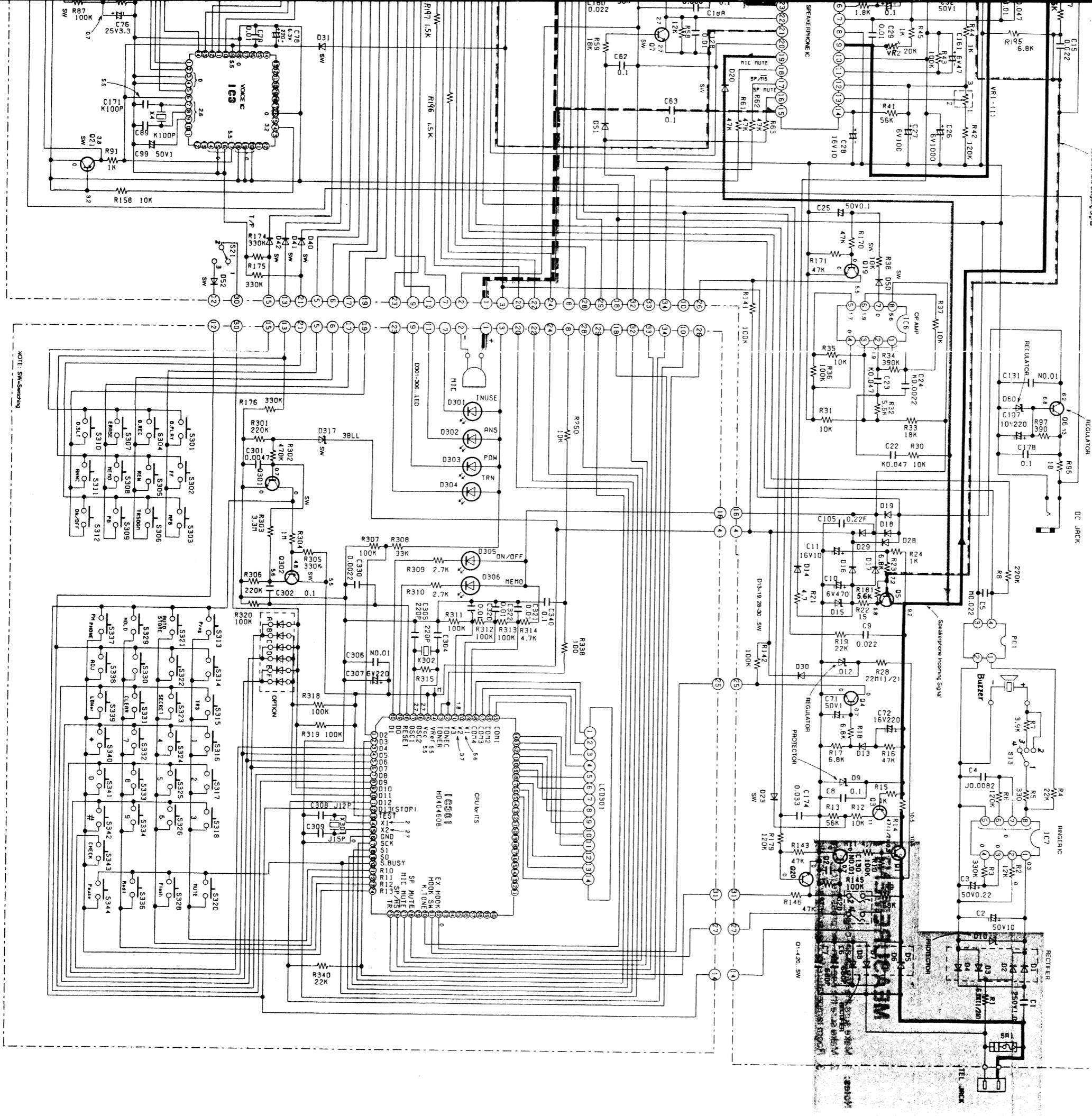
Fig. 11

SCHEMATIC DIAGRAM

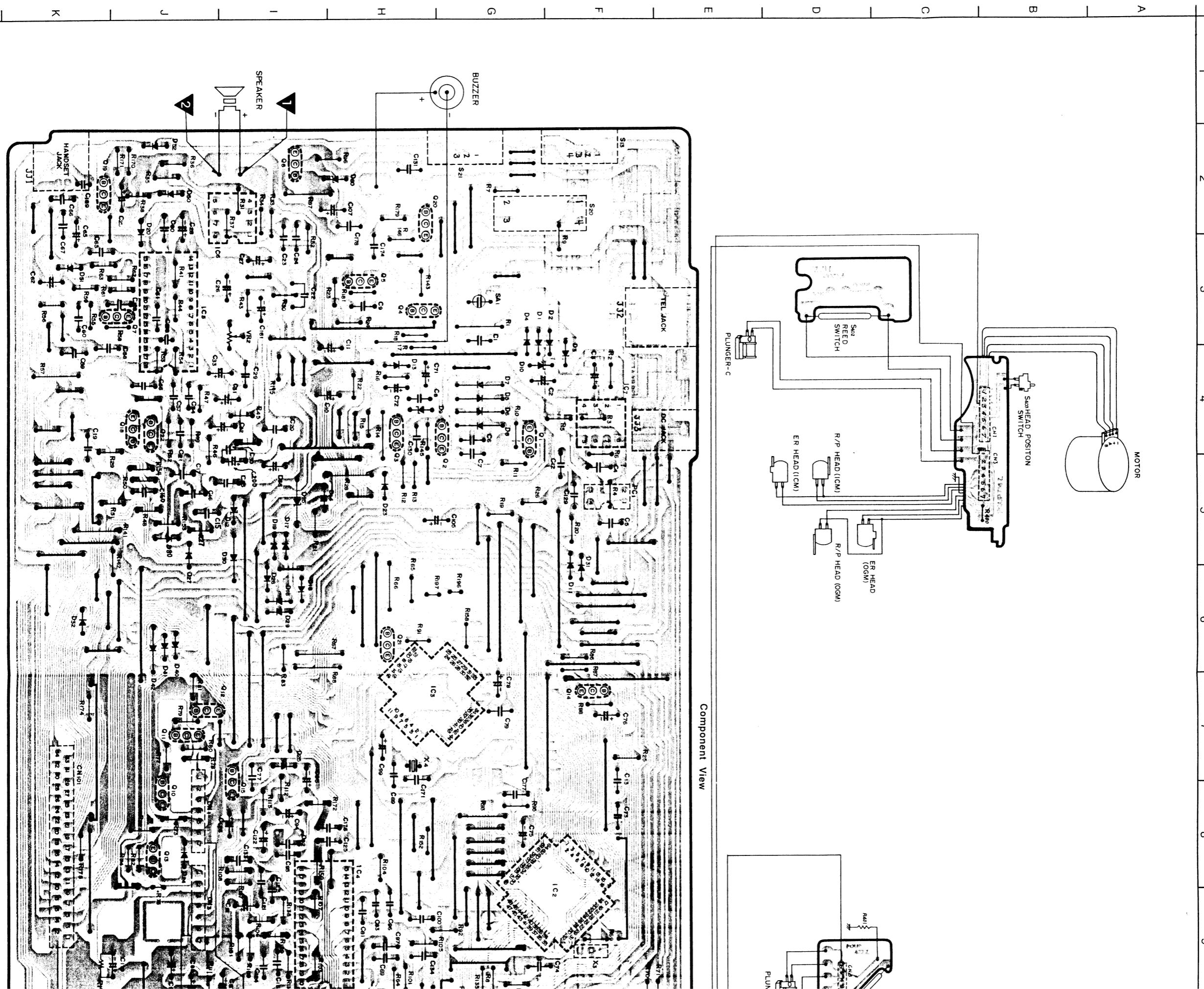


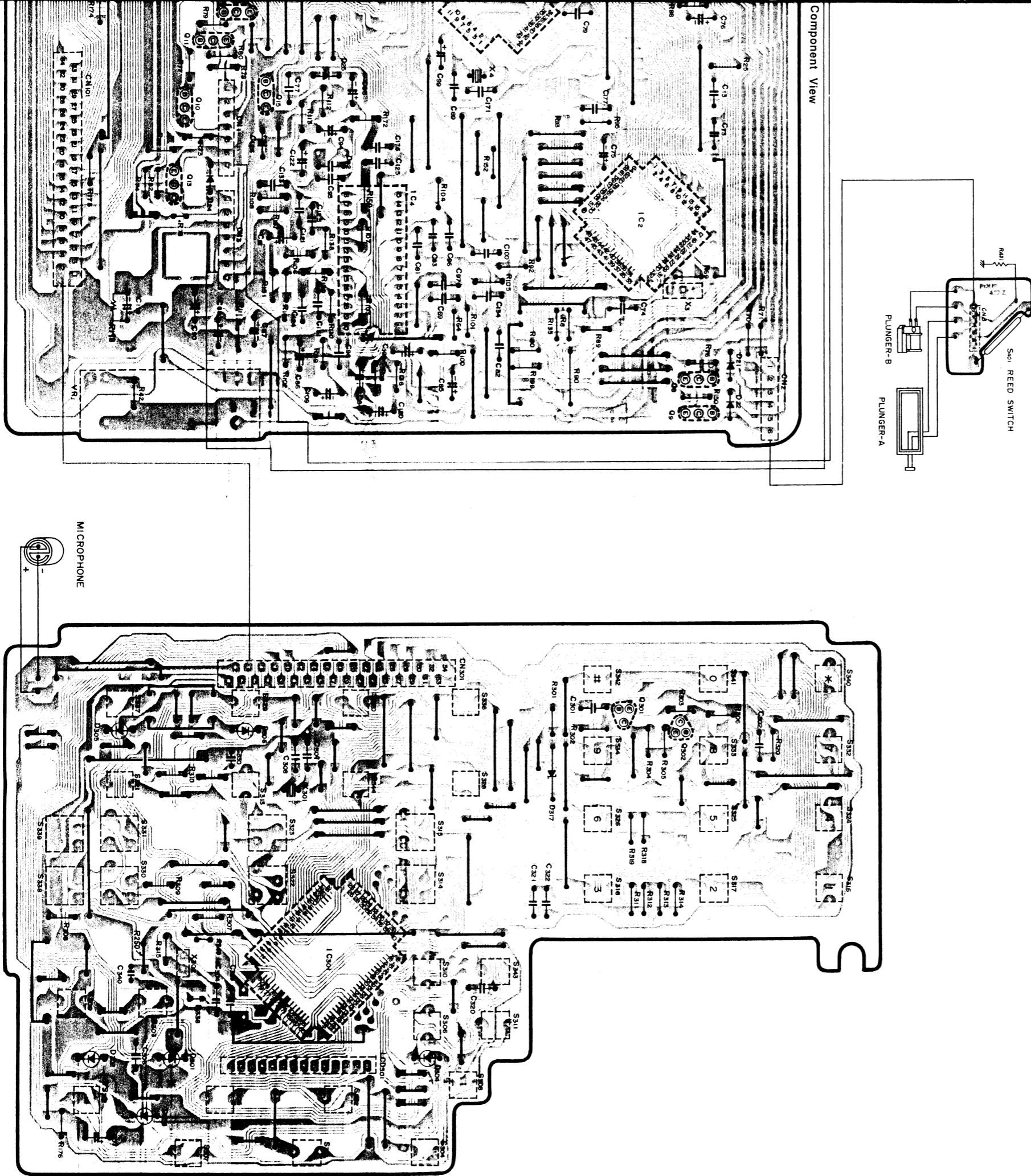
Schematic Diagram

8 9 10 11 12 13 14 15 16



CIRCUIT BOARD AND WIRING CONNECT





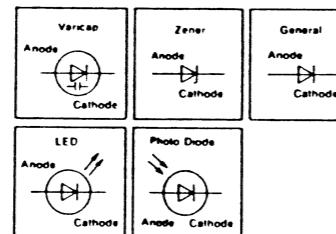
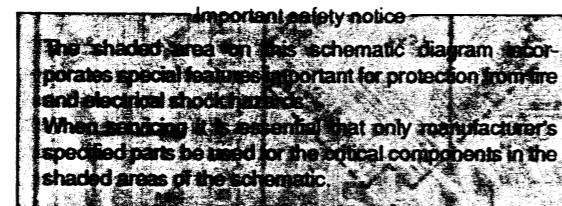
Note:
This circuit board may be modified at any time with the development of new technology.

6

■ FOR SCHEMATIC DIAGRAM

Note:

1. S13: Ringer volume selector switch in "HIGH" position.
2. S20: Hook switch in "ON-HOOK" position.
3. S21: Dialing mode selector switch in "TONE" position.
4. S301: OGM play switch.
5. S302: Fast/Forward switch.
6. S303: New message switch.
7. S304: OGM recording switch.
8. S305: Rewind switch.
9. S306: Transfer OGM switch.
10. S307: ICM erase switch.
11. S308: Memo/2 way switch.
12. S309: Playback/Pause switch.
13. S310: OGM select switch.
14. S311: Time/Day check switch.
15. S312: Power On/Off switch.
16. S313: Program switch.
17. S314,322: Direct Call switch.
18. S315: Transfer switch.
19. S316~318,: Dialing switch.
- S324~326,
S332~334,
341, 342
20. S320: Mute switch.
21. S321: Auto/Store switch.
22. S323: Secret Switch.
23. S328: Flash switch.
24. S329: Hold switch.
25. S331: Clear switch.
26. S336: Redial switch.
27. S337: SP-Phone switch.
28. S338: Time adjust switch.
29. S339: Lower switch.
30. S340: Tone switch.
31. S343: Voice memo check switch.
32. S344: Pause switch.
33. DC voltage measurement are taken with electronic voltmeter from negative line.



IC BLOCK DIAGRAM

IC4 AN6181K

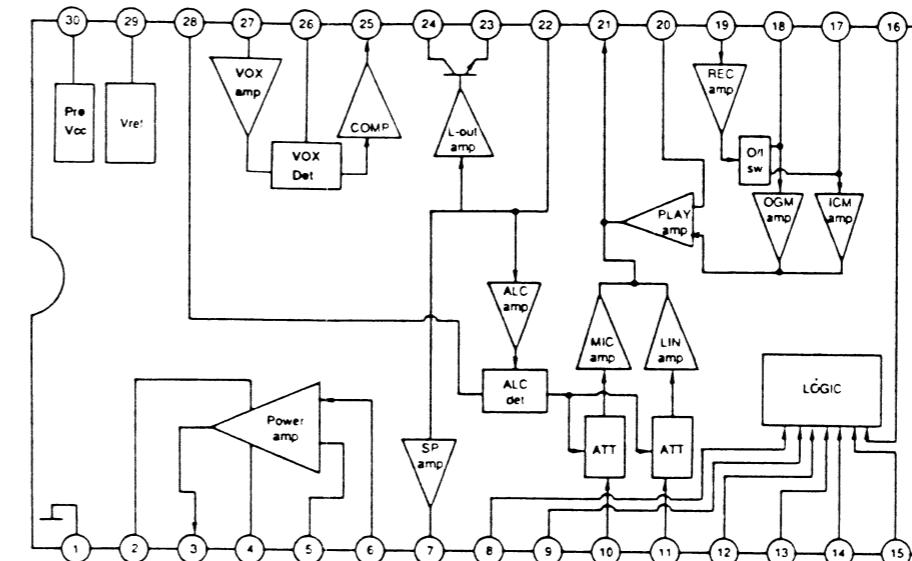


Fig. 11

IC7 PQVIBA8205

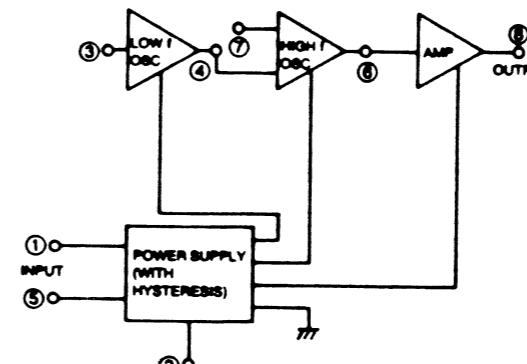


Fig. 12

IC BLOCK DIAGRAM

in "HIGH" position.
position.
in "TONE" position.

IC4 AN6181K

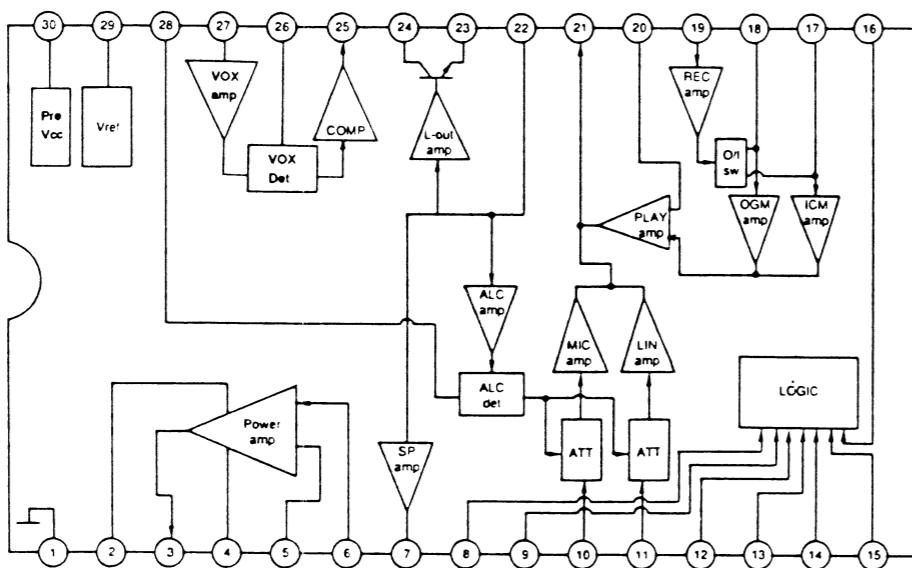


Fig. 11

IC5 PQVISC79054A

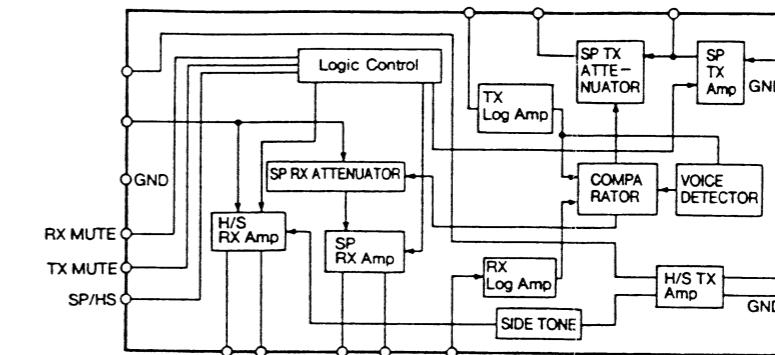


Fig. 13

IC7 PQVIBA8205

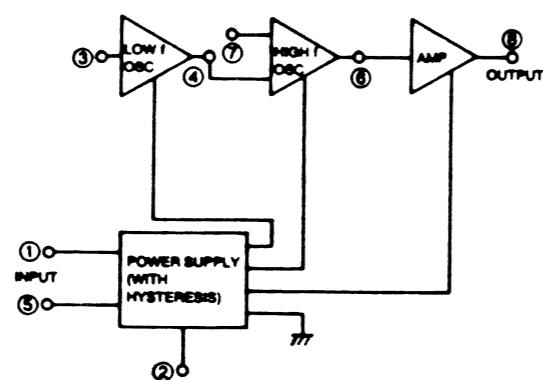


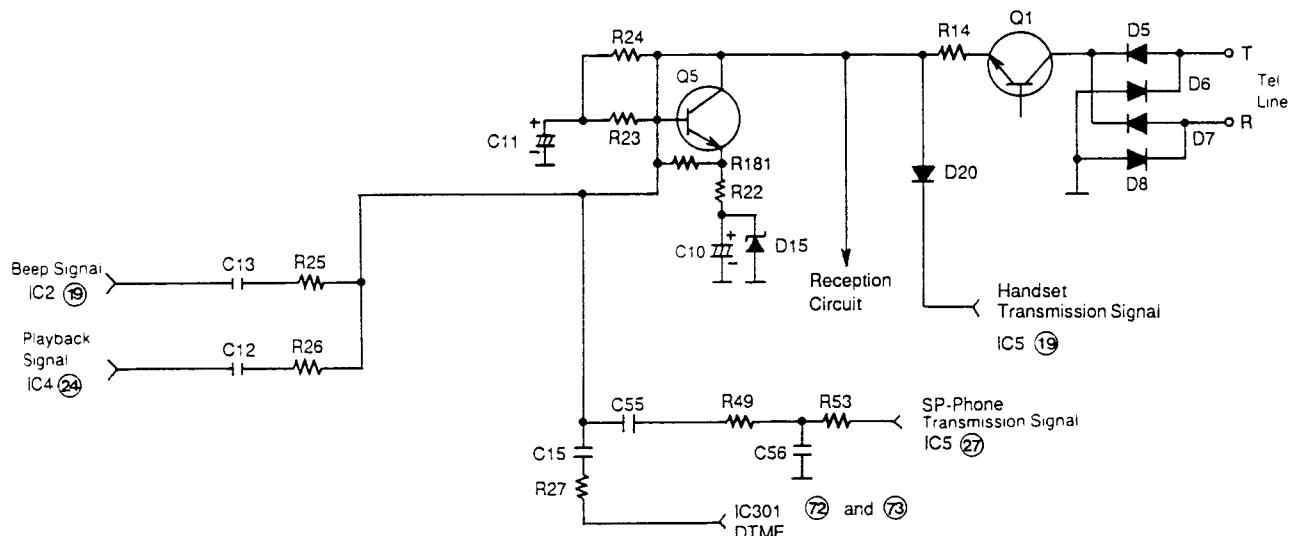
Fig. 12

■ LINE OUTPUT CIRCUIT

Each signals are sent to the telephone line as follows.

- (Beep Tone) pin 19 of IC2 → C13 → R25 →
- (Tape Playback Signal) pin 24 of IC4 → C13 → R25 →
- (Handset Transmission Signal) Handset Mic → IC5 → pin 19 of IC5 → D20 → base of Q5 → collector of Q5 → R14 → Q1 → D5~8 → Telephone Line.
- (DTMF, Hold Tone) pin 72 and 73 of IC301 → R27 → C15 →
- (Speakerphone Transmission Signal) MIC → IC5 → pin 27 of IC5 → R53 → R49 → C55 →

Circuit Diagram



■ RING DETECTOR CIRCUIT

Function:

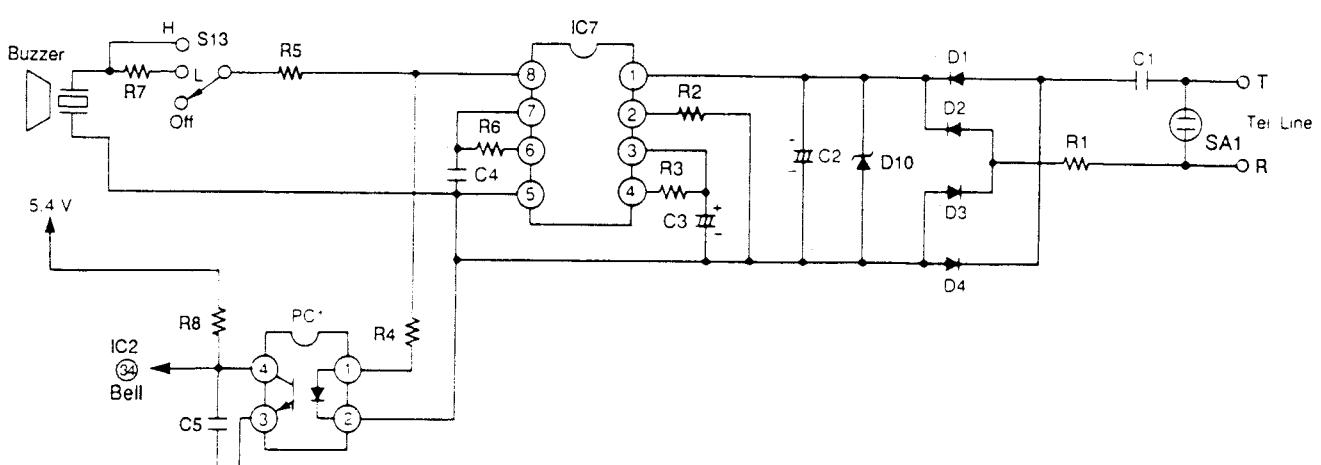
This circuit activates the CPU to respond to the ring signal from the telephone line during the ANSWER mode of operation.

Circuit Operation:

When a Ring Signal is inputted from the telephone line, a tone (ring signal) will be outputted from IC1 pin 8. (See telephone line interface.)

This ring signal flows through R4→PC1 pin 1→PC1 pin 2, hence photocoupler→PC1 pin 4-3 will turn ON. As a result, IC2 pin 34 goes Low, indicating that Ring Signal was inputted.

Circuit Diagram



■ PULSE DIAL CIRCUIT

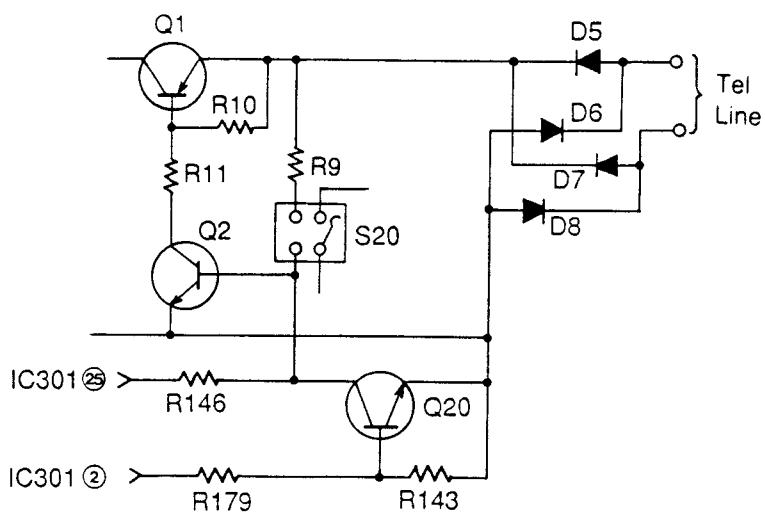
Circuit Operation:

When the hook switch S20 is ON(off-hook), the circuit is closed, and current is supplied to the base of Q2 via the diode bridge D5~8 and Q2 is ON → Q1 is ON (OFF-HOOK condition).

Q1 and Q2 are the dial pulse generating circuits, and are driven by the CPU, when the CPU pin 2 of IC301 is HIGH → Q20 is ON → Q2 is OFF and Q1 is OFF. (Break)

If port pin 2 of IC301 is OPEN \rightarrow R179 \rightarrow Q20 is OFF \rightarrow Q2 is ON \rightarrow Q1 is ON. (Make)

Circuit Diagram



■ TONE DIAL CIRCUIT

Function:

The tone dialing circuit consists of a DTMF (Dual Tone Multi Frequency) signal generator (outputted from pin 72 and 73 of the microprocessor) for tone dialing, and also a circuit of outputting the signal to line.

The DTMF circuit identifies inputs from 12 keys (1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, and #) by means of a total of seven frequencies, that is four low frequencies (Low group) and three high frequencies (High group).

Circuit Operation:

When a dial key is pressed, a DTMF signal is outputted from pin 72, 73 of IC301 as an analog synthetic wave.

The signal flow to the line is as follows.

Pin 72, 73 of IC301 → R27 → C15 → base of Q5 → collector of Q5 → R14 → collector of Q1 → emitter of Q1 → Diode Bridge → Telephone Line.

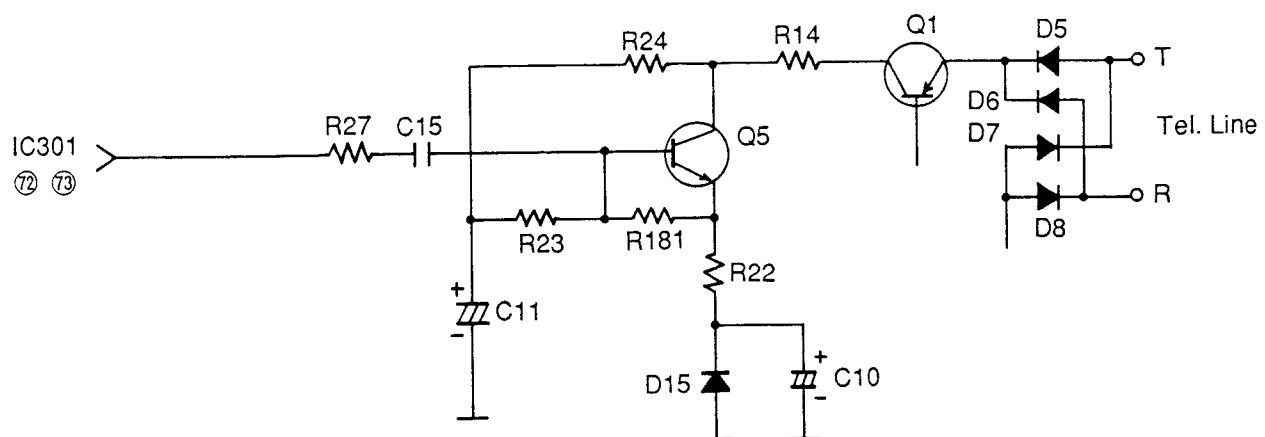
The signal combination and frequency corresponding to each dial key is shown below.

Tone Frequencies

High Group	H1	H2	H3
Low Group			
L1	1	2	3
L2	4	5	6
L3	7	8	9
L4	*	0	#

Low Group	Frequencies	High Group	Frequencies
L1	697 Hz ± 1.5%	H1	1209 Hz ± 1.5%
L2	770 Hz ± 1.5%	H2	1336 Hz ± 1.5%
L3	852 Hz ± 1.5%	H3	1477 Hz ± 1.5%
L4	941 Hz ± 1.5%		

Circuit Diagram



■ ITS RESET AND STAND BY CONTROL CIRCUIT

Function:

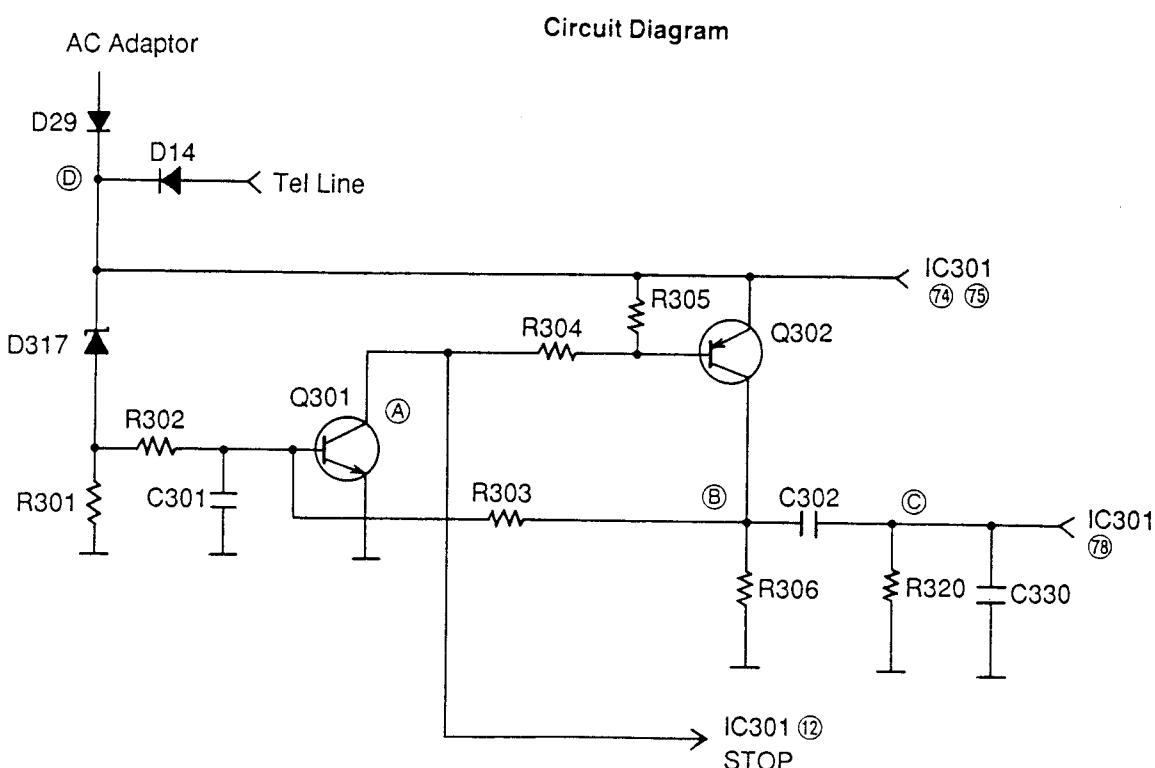
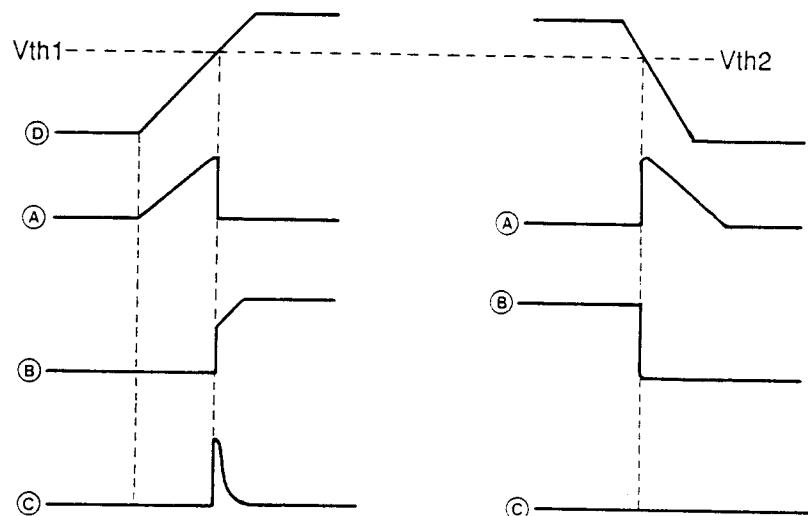
In order to hold the contents of the memory of IC301, the unit is designed so that it goes into the Stop mode when the power is cut off (memory backup mode: CPU clock stops in order to reduce power consumption).

Circuit Operation:

Timing charts ① to ④ are shown.

- 1) When the power is switched ON, the voltage will gradually rise until it reaches V_{th1} , whereupon IC301 pin 78 input port changes from a "H" → "L", and a reset is applied. Simultaneously, a "L" is inputted to IC301 pin 12 the stop input port, causing the stop mode to be cleared.
- 2) When the power is cut off, the voltage falls until it reaches V_{th2} , whereupon a "H" is inputted to IC301 pin 12, and IC301 enters the stop mode to reduce power consumption, so that only memory hold current is supplied.

1) When the power is switched on. 2) When the power is cut off.



■ CLEARING THE HOLD STATUS AND AUTO DISCONNECT CIRCUIT

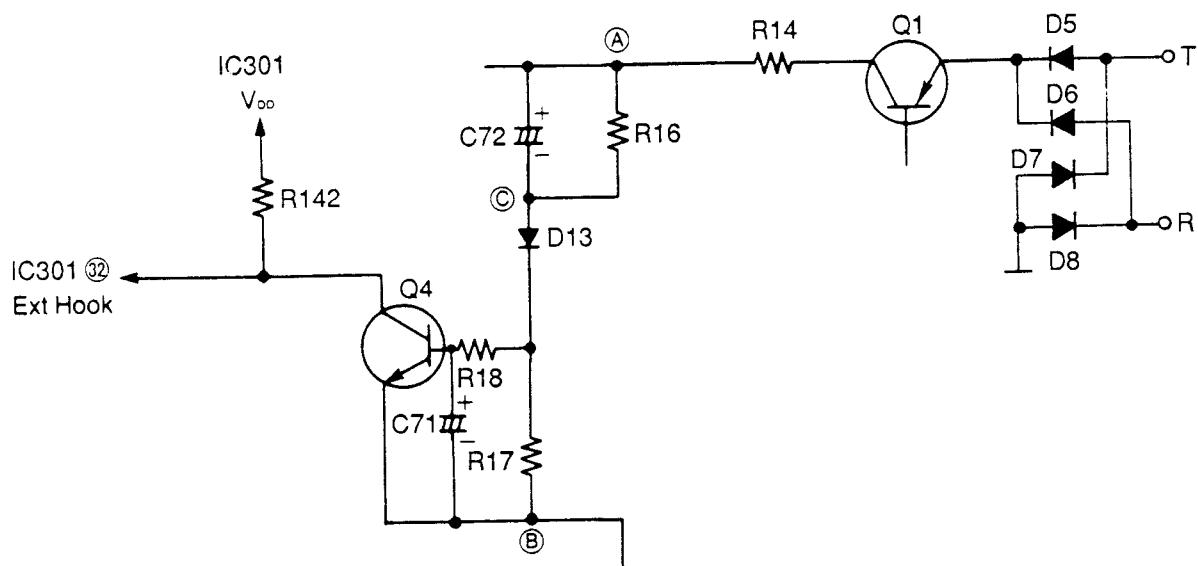
Function:

When line recording is taking place in the Hold status or a TAM ANSWER status, this unit will detect the OFF-Hook status of another telephone connected in parallel with the line and then clear the Hold status, and stops recording.

Circuit Operation:

When the unit seizes a line a voltage will be applied between points (A) and (B). At this time a voltage will be applied to the base of Q4, causing Q4 to turn ON. As a result, the collector of Q4 will go Low, and a Low status will be inputted to IC301 pin 32, thus detecting the fact that the unit has seized the line. Then, when the parallel-connected telephone goes into an OFF-Hook status, the voltage between (A) and (B) will fall. However, the charge on C72 causes the previous voltage between (A) and (C) to be retained, hence the voltage between (C) and (B) falls. Consequently, the base potential of Q4 falls, causing Q4 to turn OFF and IC301 pin 32 to go High, thus detecting the fact that the parallel-connected telephone is in an OFF-Hook status.

Circuit Diagram



■ QUICK ERASE CIRCUIT

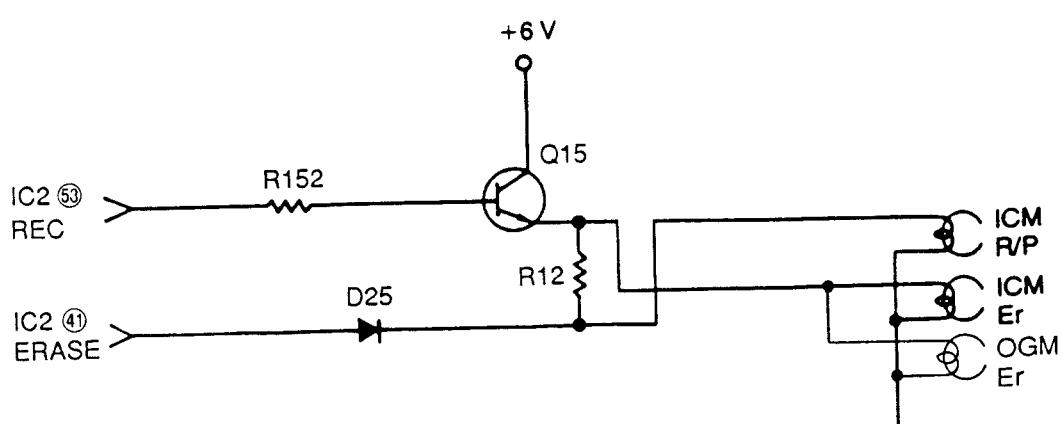
Circuit Operation:

When D25 is ON, DC current flows to ICM R/P Head.

If the erase switch is turned on, DC current will flow as follows:

Pin 41 of IC2 (High Level) → D25 → ICM R/P Head.

Circuit Diagram



■ SPEAKERPHONE CIRCUIT**Function:**

This circuit controls the automatic switching of the transmitted and received signals, to and from the telephone line, when the unit is used in the hands-free mode.

Circuit Operation:

The Speakerphone can only provide a one-way communication path.

In other words, it can either transmit an outgoing signal or receive an incoming signal at a given time, but cannot do both simultaneously. Therefore, a switching circuit is necessary to control the flow of the outgoing and incoming signals. This switching circuit is contained in IC5 and consists of a Voice Detector, Tx Attenuator, Rx Attenuator, Comparator and Attenuator Control. The circuit analyzes whether the Tx (transmit) or the Rx (receive) signal is louder, and then it processes the signals such that the louder signal is given precedence.

The Voice Detector provides a DC input to the Attenuator Control corresponding to the Tx signal.

The Comparator receives a Tx and a Rx signal, and supplies a DC input to the Attenuator Control corresponding to the Rx signal. The Attenuator Control provides a control signal to the Tx and the Rx Attenuator to switch the appropriate signals on and off. The Attenuator Control also detects the level of the volume control to automatically adjust for changing ambient conditions.

1) Transmission Signal Path

The input signal from the microphone is sent through the circuit via the following path:

- MIC → Pin 15 of IC5 → Pin 27 of IC5 → R53 → R49 → C55 → base of Q5 → collector of Q5 → Telephone Line.

2) Reception Signal Path

Signals received from the telephone line are outputted at the speaker via the following path:

- Telephone Line → C20 → R52, C21 → pin 23 of IC5 → pin 1 of IC5 → pin 7 of IC5 → pin 9 of IC5 → C80 → R98 → pin 6 of IC4 → pin 3 of IC4 → C68 → Speaker.

3) Control Signal Path

Control signals for transmission and reception are inputted to IC5 via the following path:

(Transmission Control Signal Path)

- MIC → pin 15 of IC5 → pin 2 of IC5 → C34 → R47 → pin 4 of IC5.

(Reception Control Signal Path)

- Telephone Line → C20 → R52, C21 → pin 23 of IC5 → pin 1 of IC5 → pin 7 of IC5 → pin 9 of IC5 → C80 → R98 → pin 6 of IC4 → pin 3 of IC4 → C30 → R46 → pin 6 of IC5.

4) Transmission/Reception Switching

The comparison result between Rx and Tx outputs as a DC level of IC5 pin 25.

Tx level is highpin 25 = pin 20 -6mV

Rx level is highpin 25 = pin 20 -150mV

Comparator output is connected to the attenuator control inside of IC5.

5) Voice Detector

The output of the mic amp is supplied to pin 11 of IC5 as a control signal for the voice detector.

6) Attenuator Control

The attenuator control detects the setting of the volume control through pin 13 of IC5 to automatically adjust for changing ambient conditions.

Circuit DiagramSee page 28

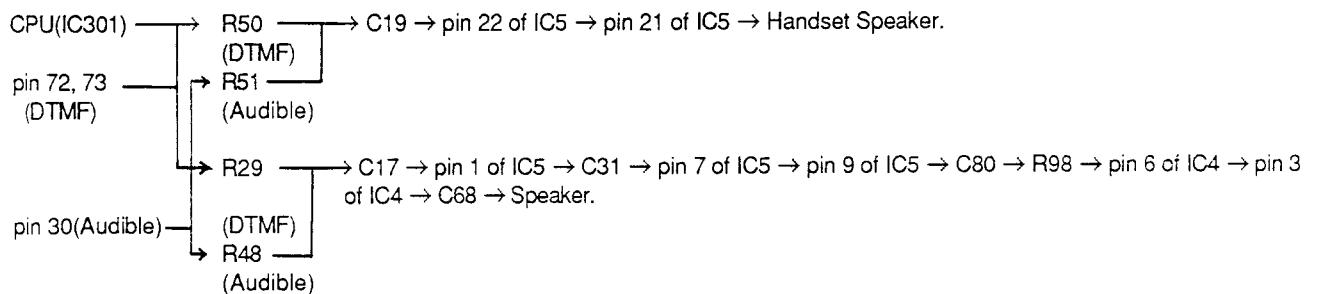
■ HANDSET TRANSMISSION, RECEPTION AND DTMF SIGNAL OUTPUT CIRCUIT

Operation:

- Transmission
Handset Microphone → pin 26 of IC5 → pin 25 of IC5 → pin 24 of IC5 → pin 19 of IC5 → Q1 → Diode bridge → Telephone Line.

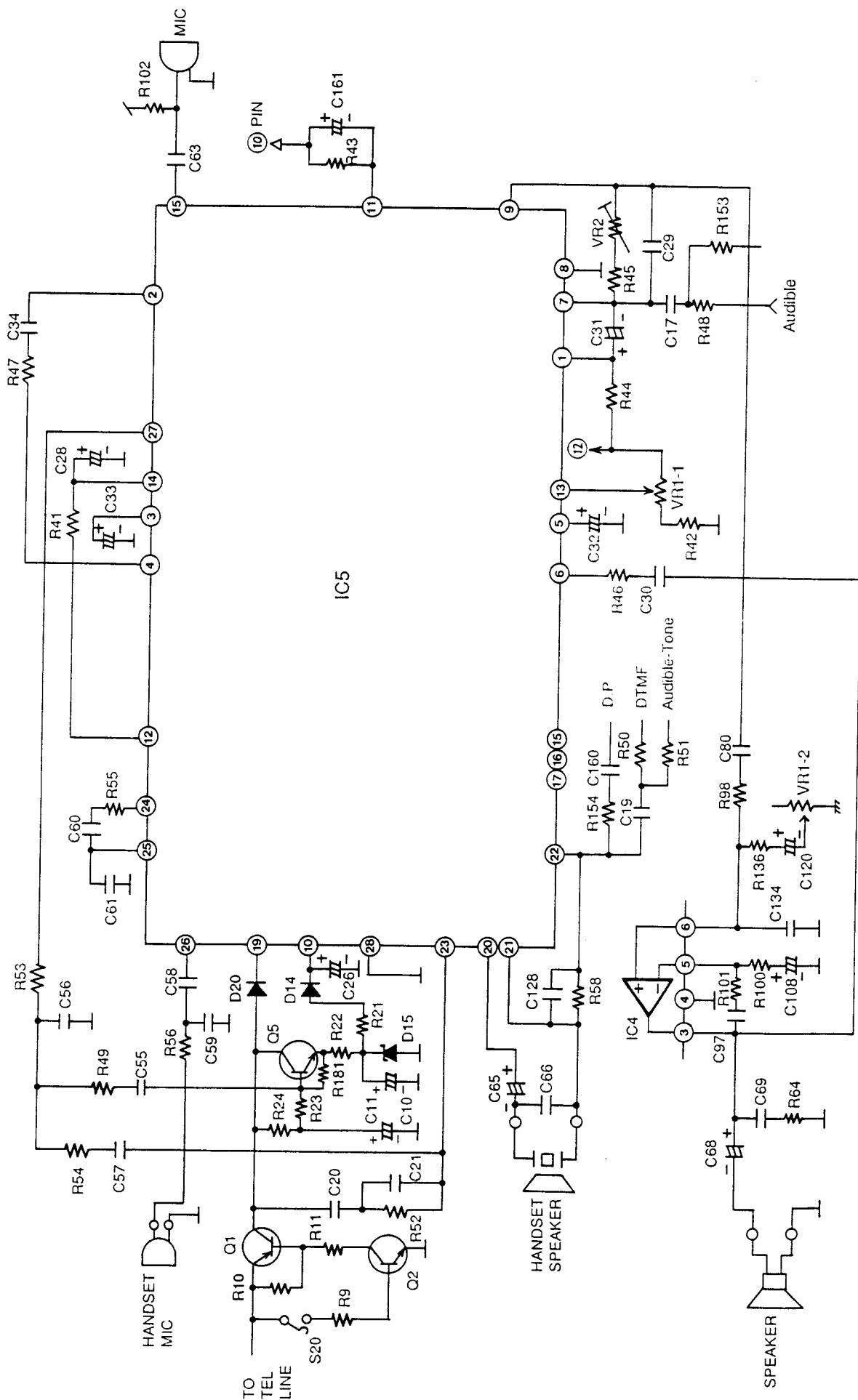
- Reception
Telephone Line → Diode bridge → Q1 → C20 → R52, C21 → pin 23 of IC5 → pin 21 of IC5 → Handset Speaker.

- DTMF and Audible Tone



Circuit DiagramSee page 28

Circuit Diagram



■ VOX CIRCUIT

Function:

The VOX circuit is designed to detect cyclic signals in which the signal is ON for 100 msec. to 1 sec, continuous sounds and no sound at all.

After detection, the CPU issues an instruction that makes VOX operation possible.

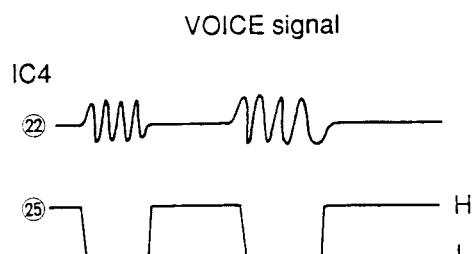
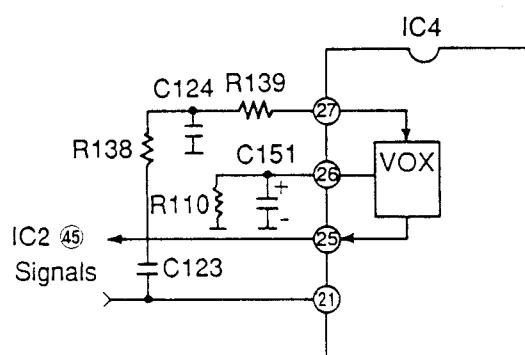
This means that when a telephone call has ended, the phone is reset and is ready to receive the next call.

Circuit Operation:

The VOX Signal flow as follows:

Pin 27 of IC4 → pin 25 of IC4 → pin 45 of IC2 (Vox).

Circuit Diagram



■ CPC (CALLING PARTY CONTROL) DETECTOR CIRCUIT

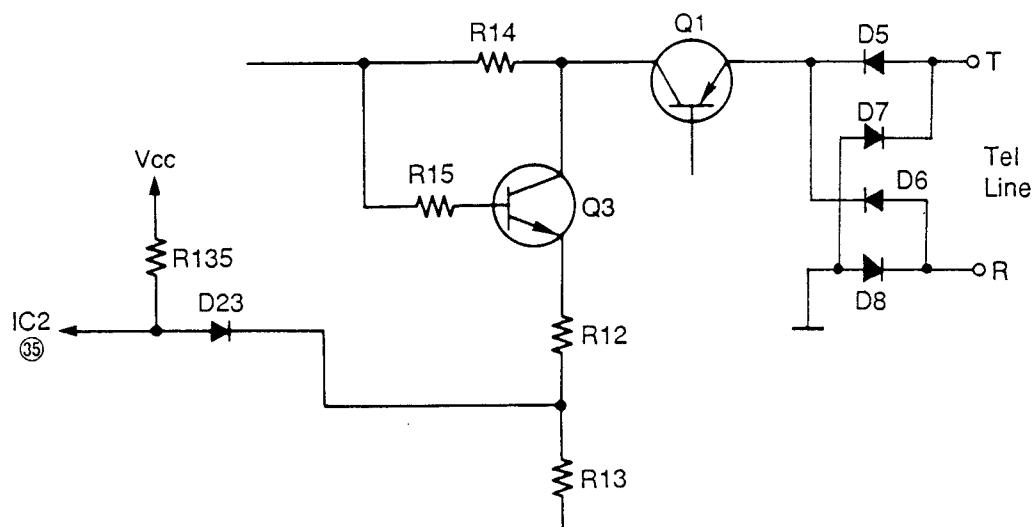
Function:

The CPC DETECTOR complements the units shut off, in the ANSWER mode, after the caller hangs up. At this time, the CPC DETECTOR takes over. The CPC DETECTOR senses the temporary disconnection of the telephone line which occurs after the caller hangs up.

Circuit Operation:

When the unit seizes a line, current will flow through Diode bridge, Q1 and R14. As a result, voltage will be applied across both ends of R14, causing current to flow to the base of Q3 via R15, causing Q3 will turn ON. Consequently, voltage will be applied across both ends of R12 and R13. As a result, IC2 pin 35 will go High through D23. If then the line is momentarily cut, line current will cease to flow, and voltage will no longer be applied across R14, thus and Q3 will turn OFF. IC2 pin 35 will go Low, hence this condition will be detected.

Circuit Diagram



■ RECORD CIRCUIT (OGM and ICM)

Circuit Operation:

(Recording Signals)

Recording signal from the telephone line or MIC is selected by IC5.

The recording signal flows as follows:

Mic → C109 → R99 → pin 10 of IC5 → Pin 21 of IC5 → R137 → C122 → pin 19 of IC5 → pin 17 of IC5 → C95 → ICM Head.

Tel line → R199 → C83 → pin 11 of IC5 →

pin 18 of IC5 → C94 → OGM Head

(Signal)

The beep tone is generated by IC2.

The beep tone of the ICM recording (from pin 20 of IC2) is processed in the ICM recording head via C96 and R104.

(Erase)

When in the Rec mode, pin 63 of IC2 is High.

The voltage is applied to the Erase Head, thus the Erase Head is activated.

The bias current is applied to the R/P Head via Q15, R112 and R113.

The DC current flows is as follows;

6V DC → Q15 turns ON(by High level of IC2 pin 63) → collector of Q15 → emitter of Q15 → Erase Head.

Circuit Diagram See page 31

■ PLAYBACK CIRCUIT (OGM, ICM MESSAGE)

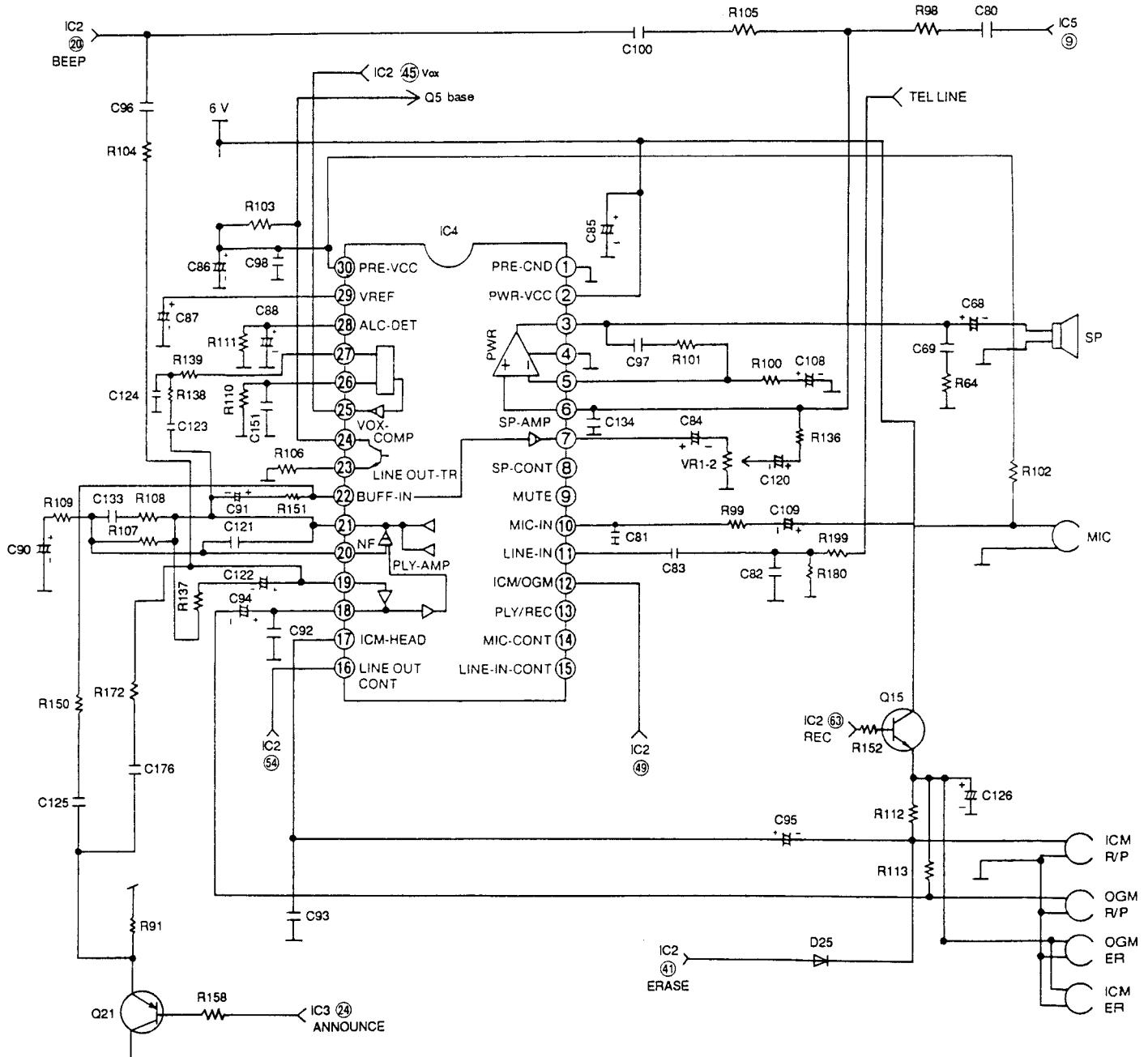
Circuit Operation:

The playback signal for OGM and ICM MESSAGE is selected by IC4.

- ICM R/P Head → C95 → pin 17 of IC4 → pin 21 of IC4 → C91 → R151 → pin 22 of IC4 → pin 7 of IC4 → C84 → VR1 → C120 → R136 → pin 6 of IC4 → pin 3 of IC4 → C68 → Speaker.
- OGM R/P Head → C94 → pin 18 of IC4 →

Circuit Diagram See page 31

Circuit Diagram

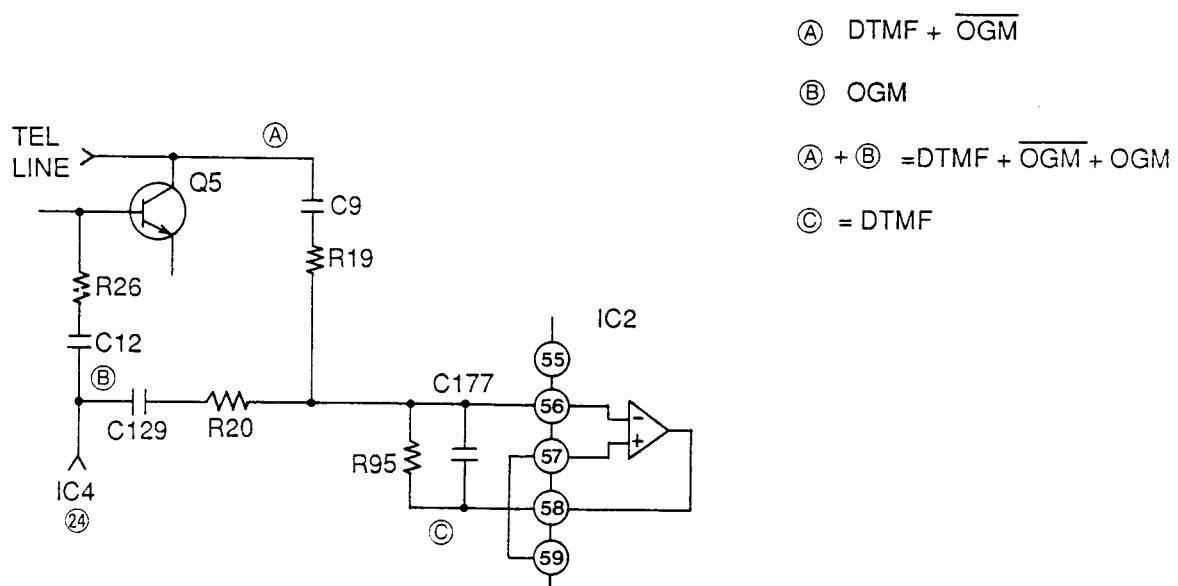


■ REMOTE SIGNAL DETECTOR CIRCUIT

A remote control signal is used with the dial-tone multiple- frequency (DTMF) signal.

The remote signal output from the telephone line via Q5, R19 and C9. And it is inputted to pin 56 of IC2 passed through C9 and R19. The DTMF signal is inputted to pin 56 of IC2.

Circuit Diagram



■ POWER SUPPLY CIRCUIT

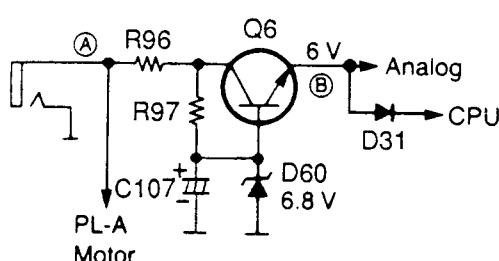
Function:

Power from the AC adaptor passes through the 1-stage regulating block consisting of Q6 and provides system voltages of 5 V.

Circuit Operation:

Power from the AC adaptor is supplied directly to the plunger (A). Q6 is the first stage regulated power supply. The voltage at point B is regulated to 6 V by the 6.8 V zener voltage of D60. The 6 V voltage is shifted by D31 to 5.4 V which is used to power CPU etc.

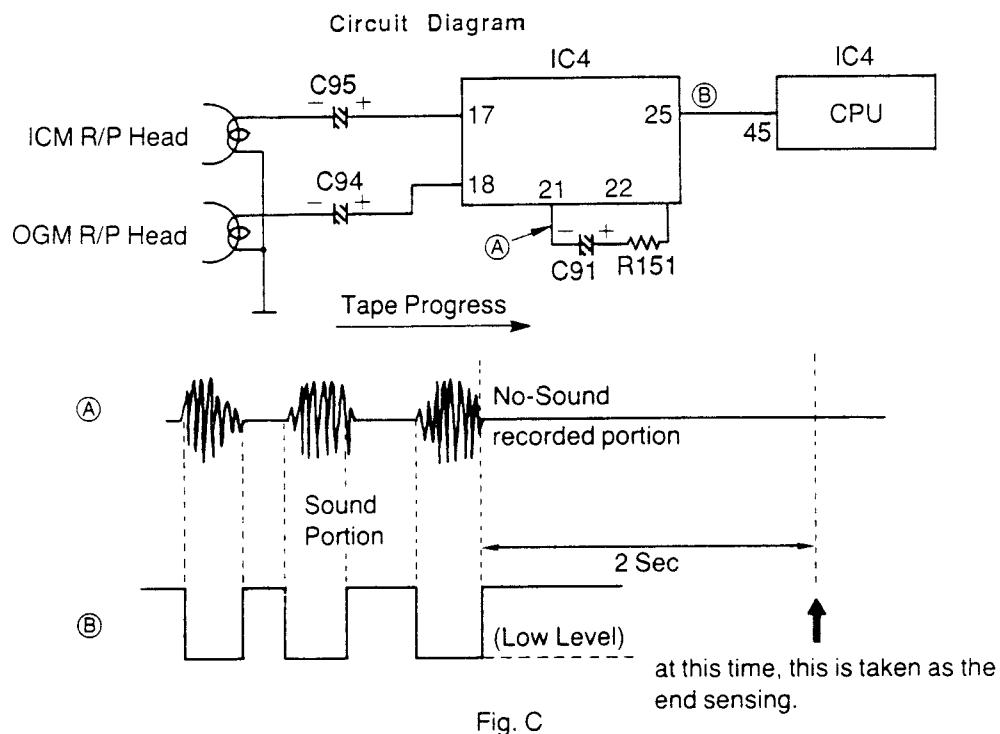
Circuit Diagram



■ END OF OGM DETECTING CIRCUIT

Circuit Operation:

When the Stop Button is pressed upon completion of OGM recording, no sound signals is recorded on the tape. A no-sound detection system is used during play back. If a no-sound condition exists for 2 seconds, the CPU detects the OGM end by the output of Vox Circuit (Fig. C).

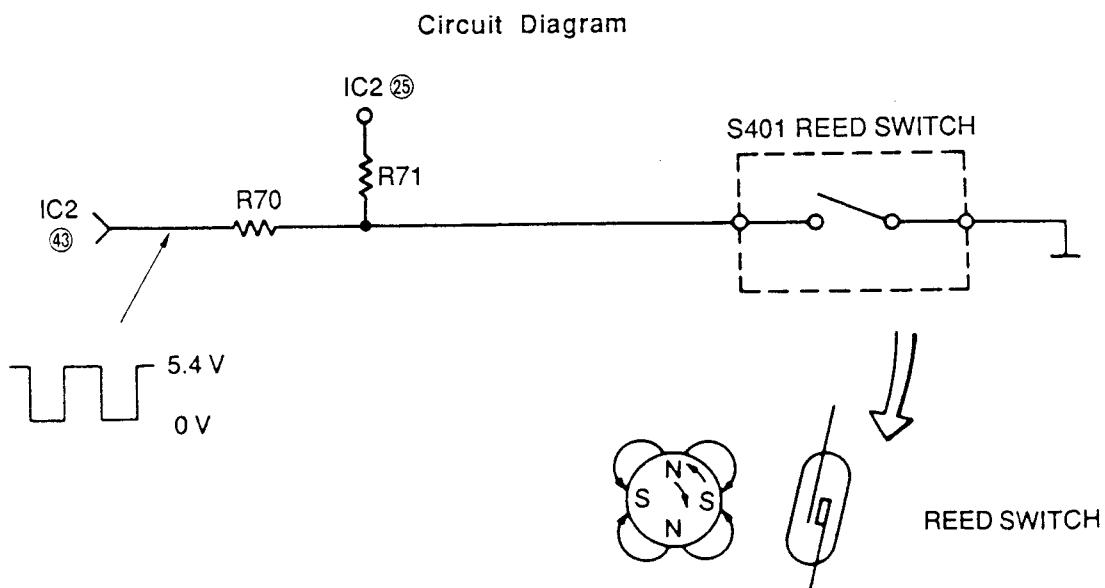


■ ICM TAPE ROTATION DETECTING CIRCUIT

Circuit Operation:

When there are changes in the direction of the magnetic field caused by the rotation of the four-pole ferrite magnet they are detected by the Reed Switch. This output is added to the microcomputer input.

Reed Switch (S401) → R70 → pin 43 of IC2



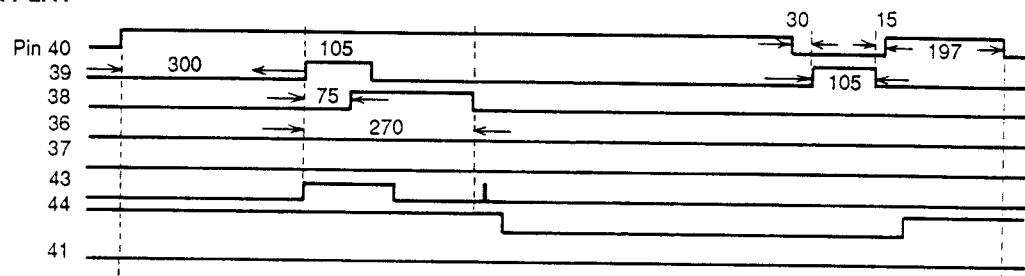
■ TAPE TRANSPORT CONTROL

Circuit Operation:

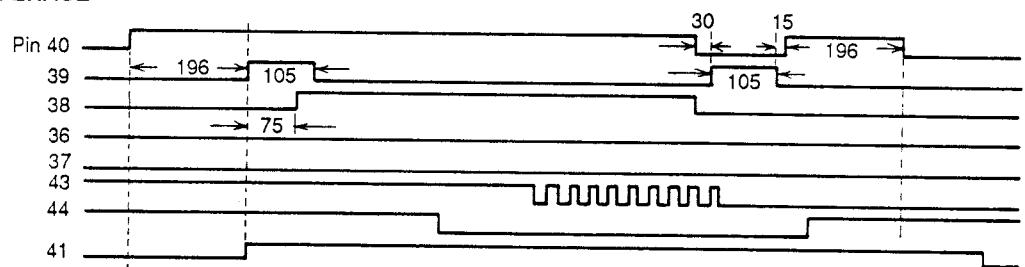
The timing for the plunger and motor which are used to operate the deck is as shown in the timing chart.

Timing Chart

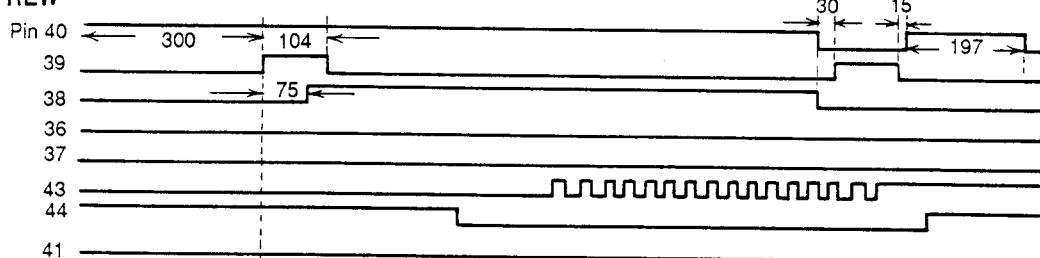
•ICM PLAY



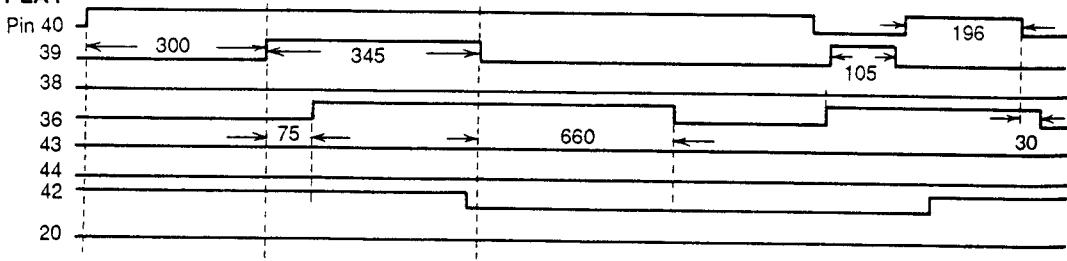
•ICM ERASE



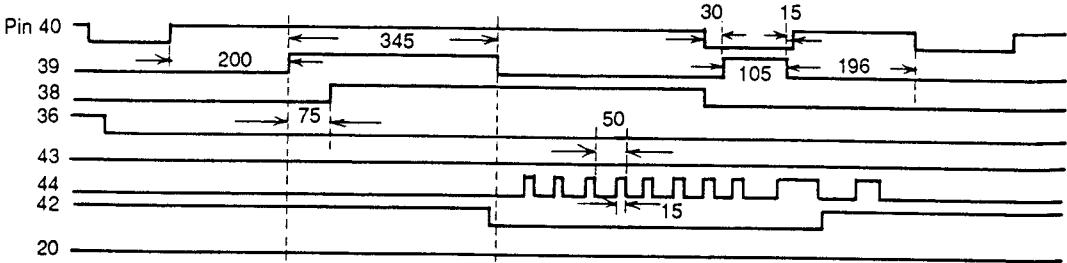
•ICM REW



•OGM PLAY



•OGM REW

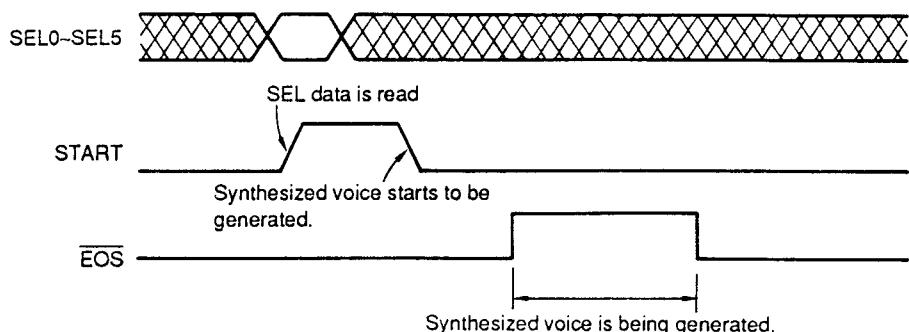
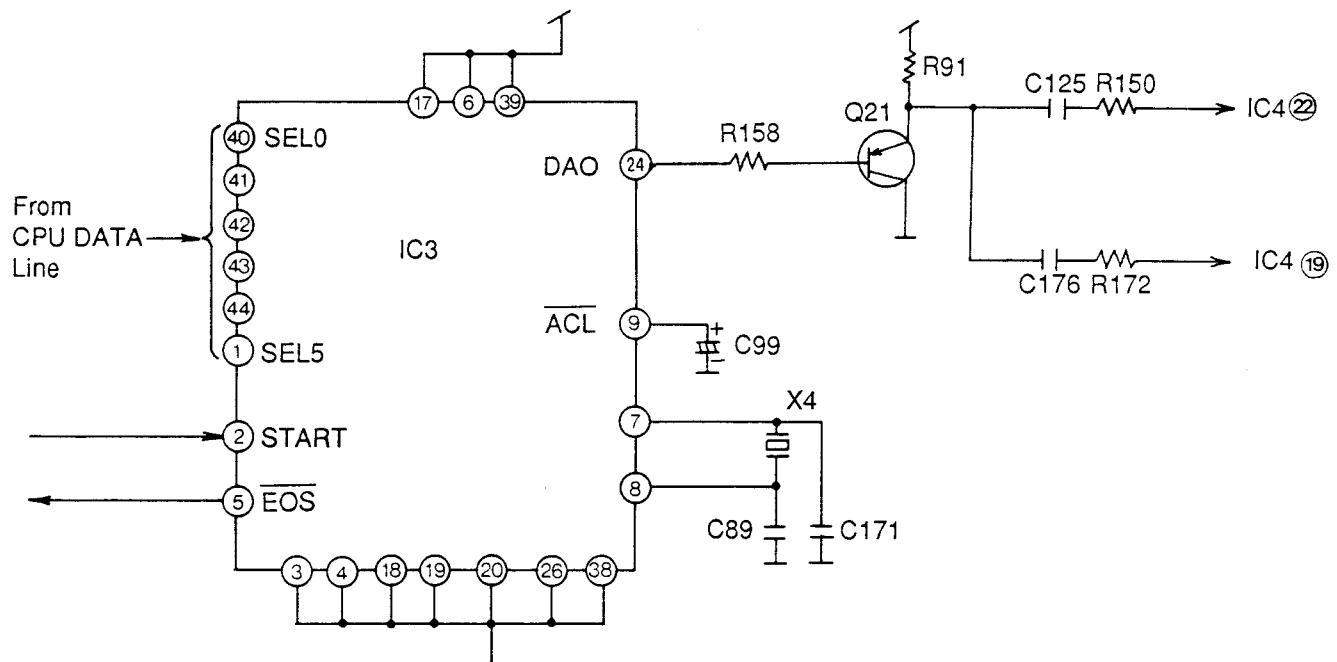


■ VOICE SYNTHESIZER GENERATION CIRCUIT

Function:
Circuit for Time Day Stamp and Voice Menu.

Circuit Operation

IC3 is the Voice Synthesizer circuit. Data SEL0-SEL5 are specified by IC2, and then the START pulse is sent to 2-pin, generating a synthesized voice on DA0. The synthesized voice generated on DA0 is sent to 22-pin of IC4 or 19-pin of IC4 through the Buffer (Q21), and then output to the SP, line and tape. While the voice is generated, EOS goes low. C89, C171, and CF consist of the 800 kHz pulse generator circuit. Pin 9 functions as a reset input terminal.



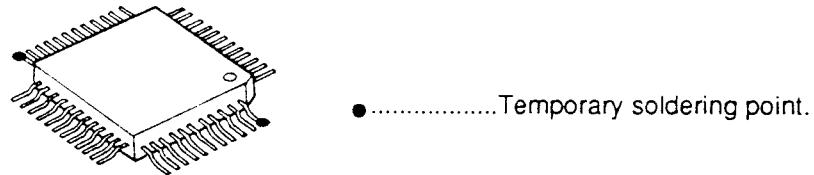
HOW TO REPLACE FLAT PACKAGE IC

■ PREPARATION

- SOLDER Sparkle Solder 115A-1, 115B-1
OR
Almit Solder KR-19, KR-19RMA
- Soldering iron Recomended power consumption will be between 30w to 40w.
Temperature of Copper Rod $662 \pm 50^{\circ}$ F ($350 \pm 10^{\circ}$ C)
(An expert may handle 60~80w iron, but beginner might damage foil by overheating)
- Flux HI115 Specific gravity 0.863
(Original flux will be replaced daily.)

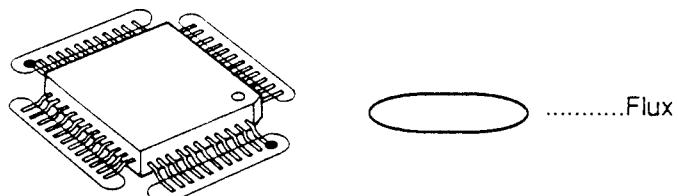
■ PROCEDURE

1. Temporary fix FLAT PACKAGE IC by Soldering on marked 2pins.

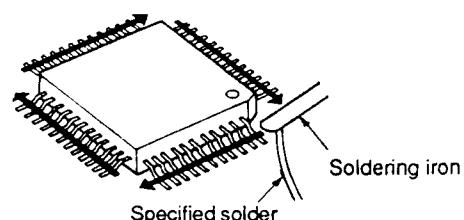


*Most important matter is accurate setting of IC to the corresponding soldering foil.

2. Apply flux for all pins of FLAT PACKAGE IC.

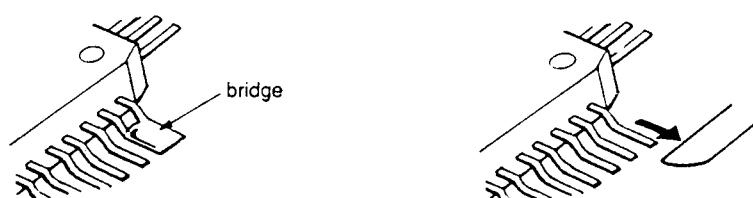


3. Solder employing specified solder to direction arrow, as slide the soldering iron.



■ MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridging portion.
2. Remove remained solder along pins employing soldering iron as shown in below Figure.



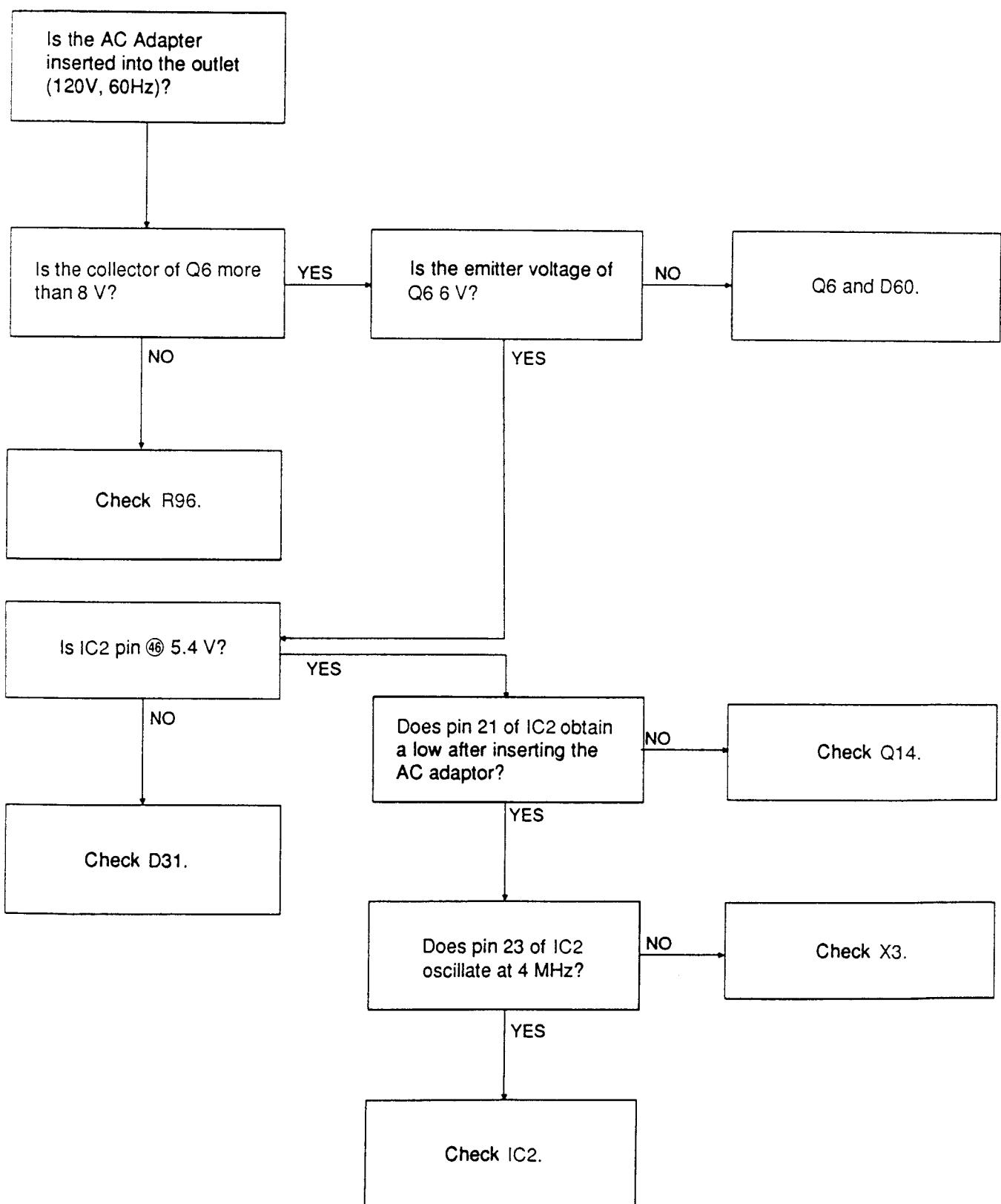
TROUBLE SHOOTING GUIDE

1). SERVICE HINTS

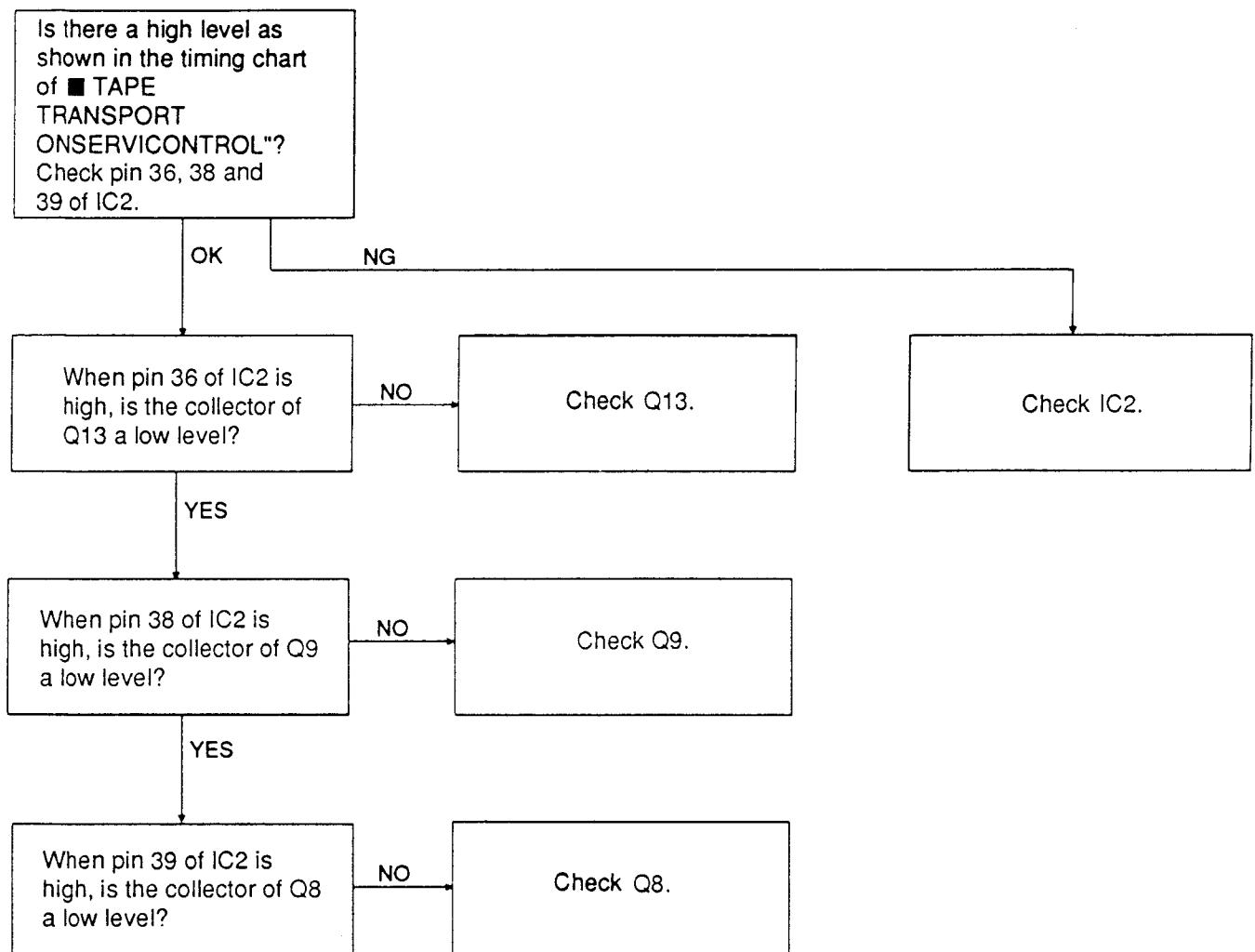
SYMPTOM	CURE
Does not ring.	Replace IC7 and Ringer SW.
Answering Machine rings, when no one calls.	Check pin 3 and 4 of PC1 for short.
OGM recording distorted.	Check for cold solder joints on IC4.
No PWR/ AFTER PWR fixed no plunger a activation.	Check Q8, Q9 and Q13.
Intermittent rewind.	Check S305.
Goes into hold after taking ICM.	Check pin 45 of IC2.
Keypad inop.	Check solder connections on CN301 and IC301..
Can dial out but incoming calls get busy signal.	Check Q1 , Q2, D5~8 and SA1.
Holds line constantly.	Check Q1 and Q2.
Would not record all OGM.	Check IC4.

(TAM)

1) NO FUNCTIONS OPERATE.



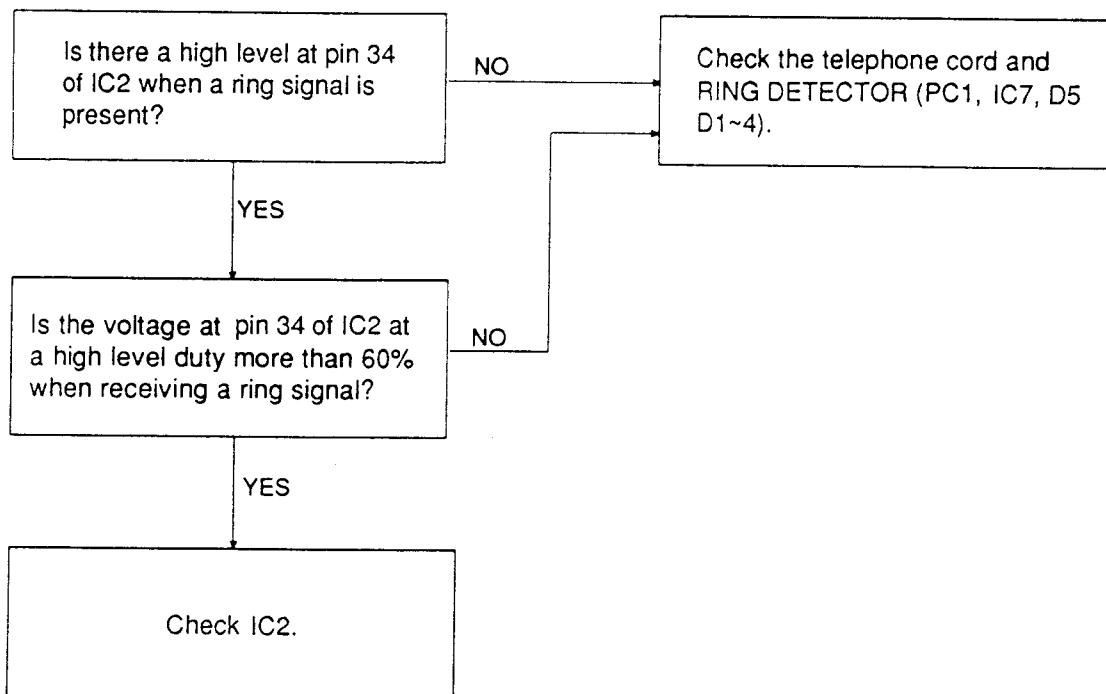
2) THE PULL OF PLUNGER IS POOR OR NOT AT ALL.



3) FAST ERASE DOES NOT WORK.

Check pin 5 of CN5 (when pin 41 of IC2 is High).

4) DOES NOT ANSWER TELEPHONE CALL



5) •ICM CONTINUES TO RECORD AFTER THE CALLER HANGS UP.
•END OF MESSAGE CLIPPED WHEN CALLER HANGS UP.

When caller hangs up, the KX-T2470 can detect the following 4 signal type.

- A. CPC pulse.
- B. Dial tone or other continuous tones.
- C. Silence.
- D. Cyclic signals.

A. Check CPC DETECTOR CIRCUIT (Q3, R12, R13, R14, R15, R135, D23, IC2 pin 35.)
B., C., D.
Check VOX DETECTOR (IC2 pin 45).

6) REMOTE CONTROLLER DOES NOT WORK/RESPONSE IS POOR.

The following are considered for the causes of no remote reception:

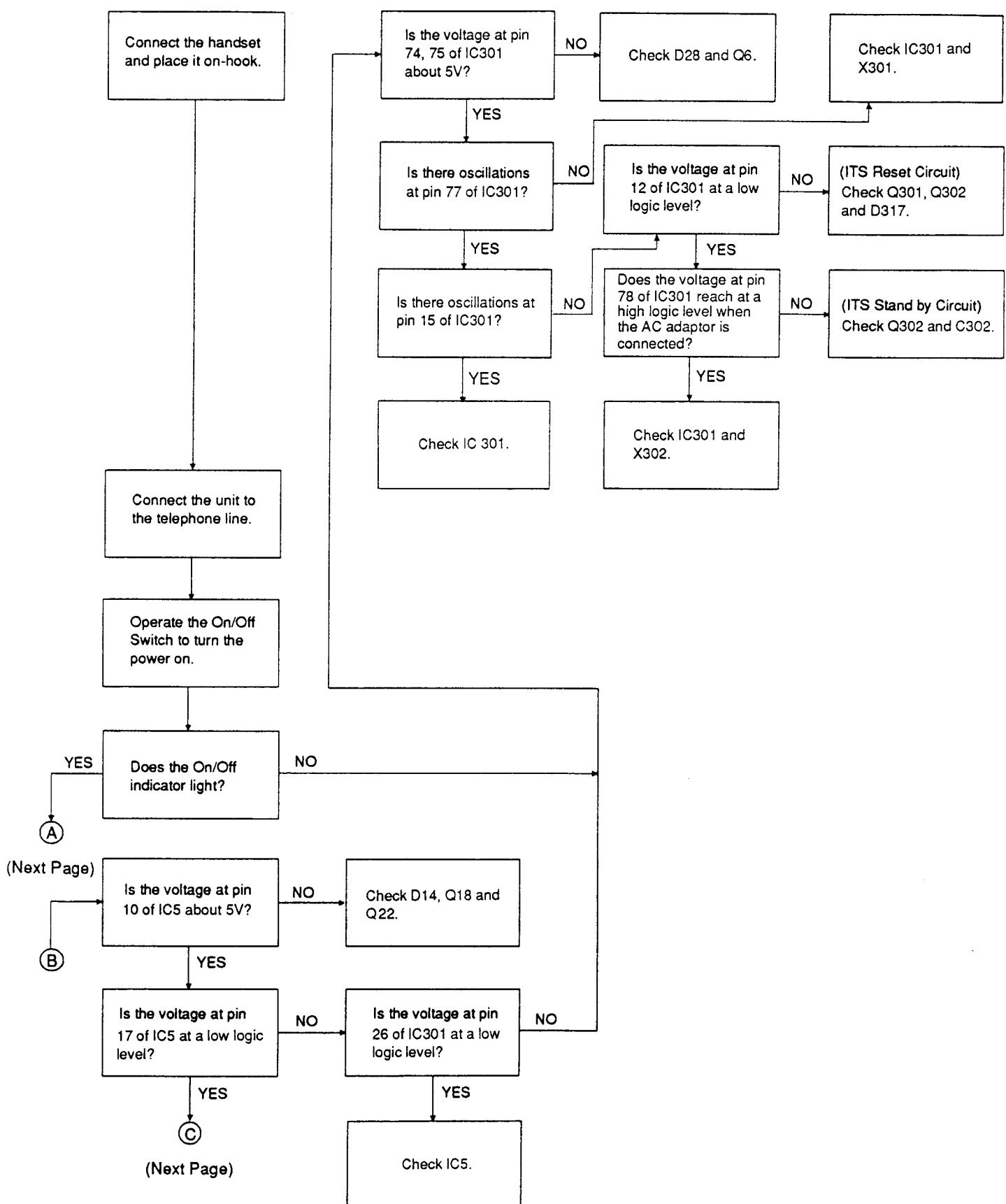
- A. Is the security code the same as set on the unit.
- B. High distortion in LINE OUTPUT CIRCUIT causing interference between the transmitting signal and the remote signal.
- C. Excessive loss in telephone line.

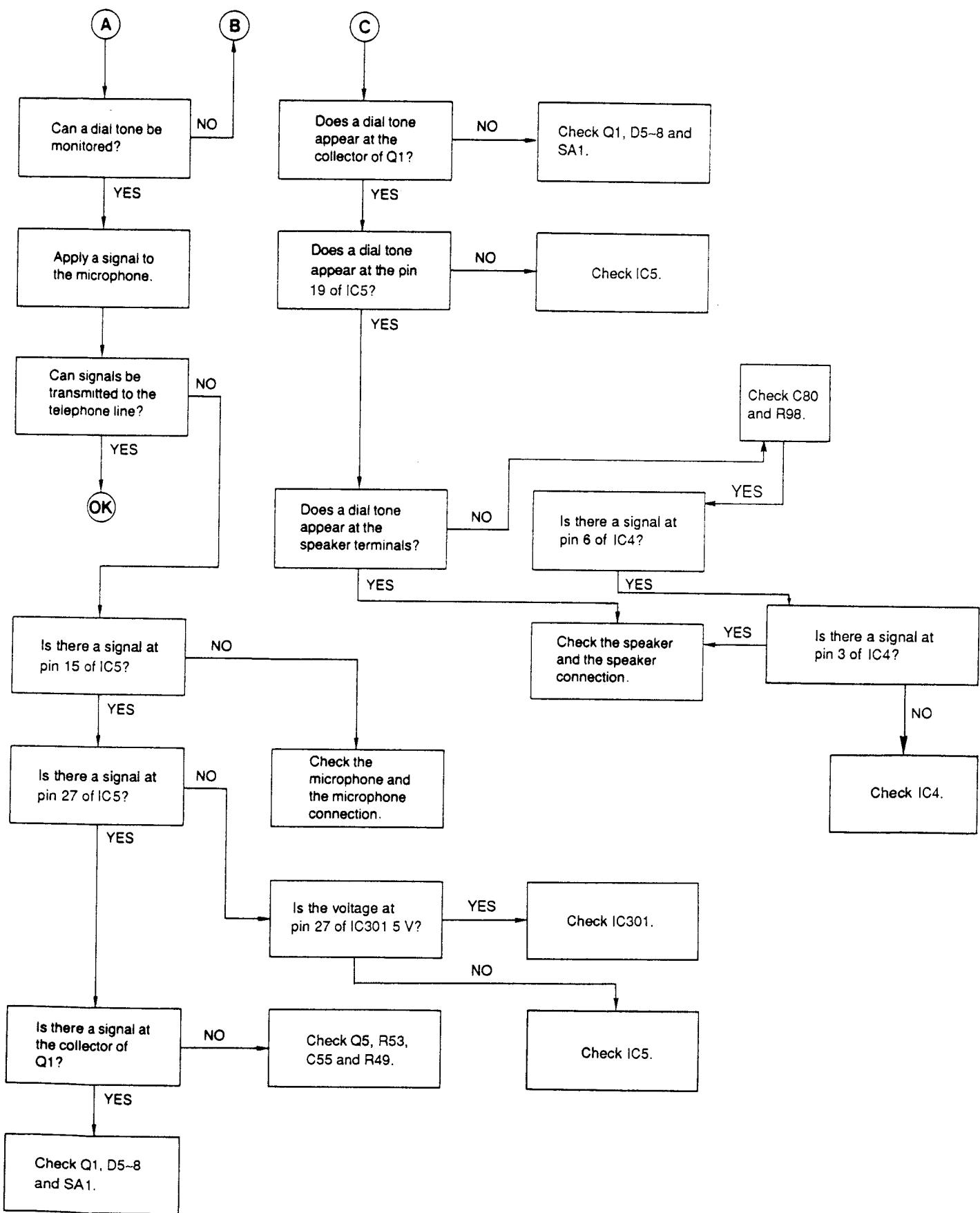
A. Check the security code of the unit.
B. Check LINE OUTPUT CIRCUIT (Q5).
C. Test on telephone line known to be working properly.

* If all of the above check N.G., check the remote controller detect circuit (IC4).

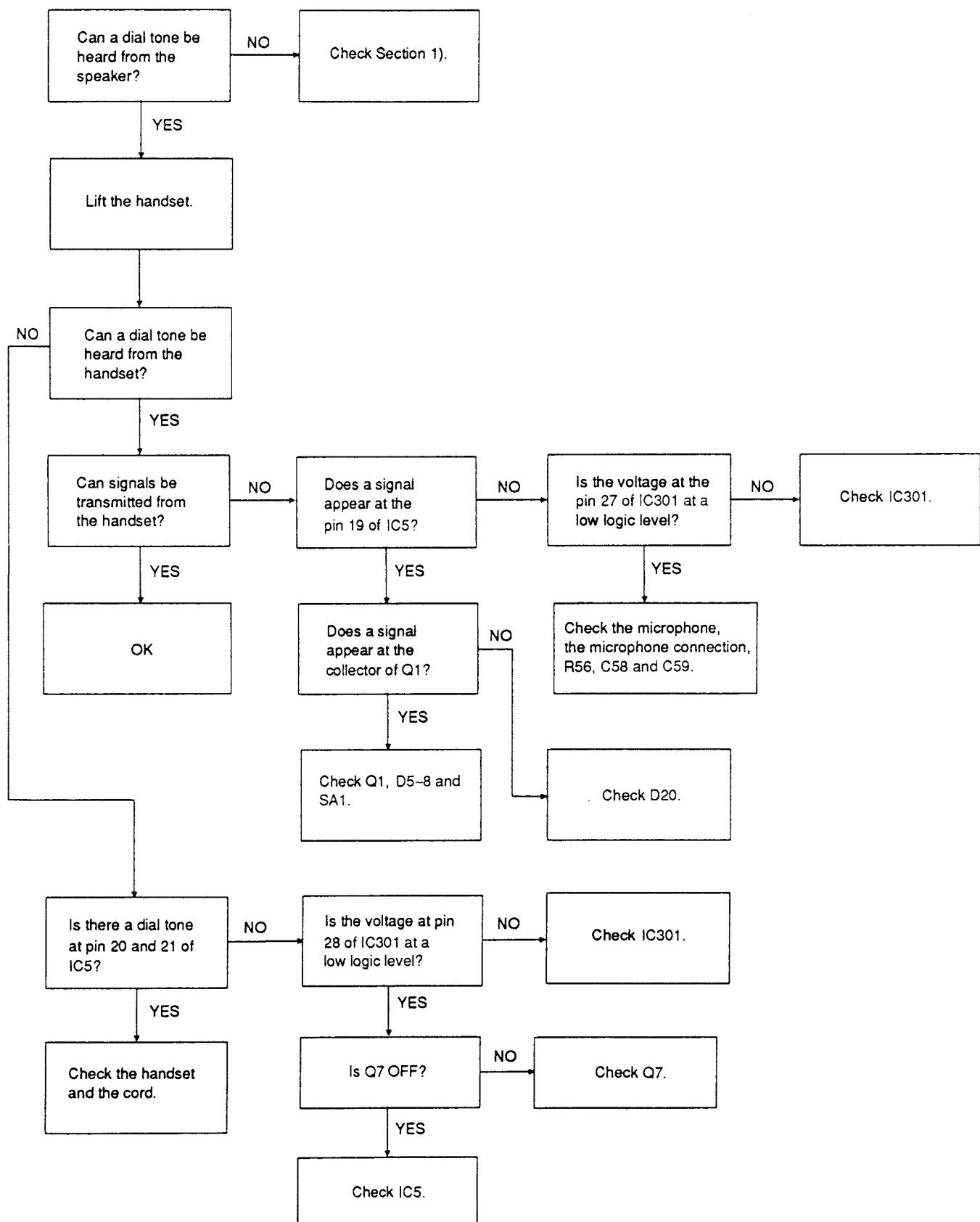
(ITS)

1. UNIT DOES NOT TURN ON

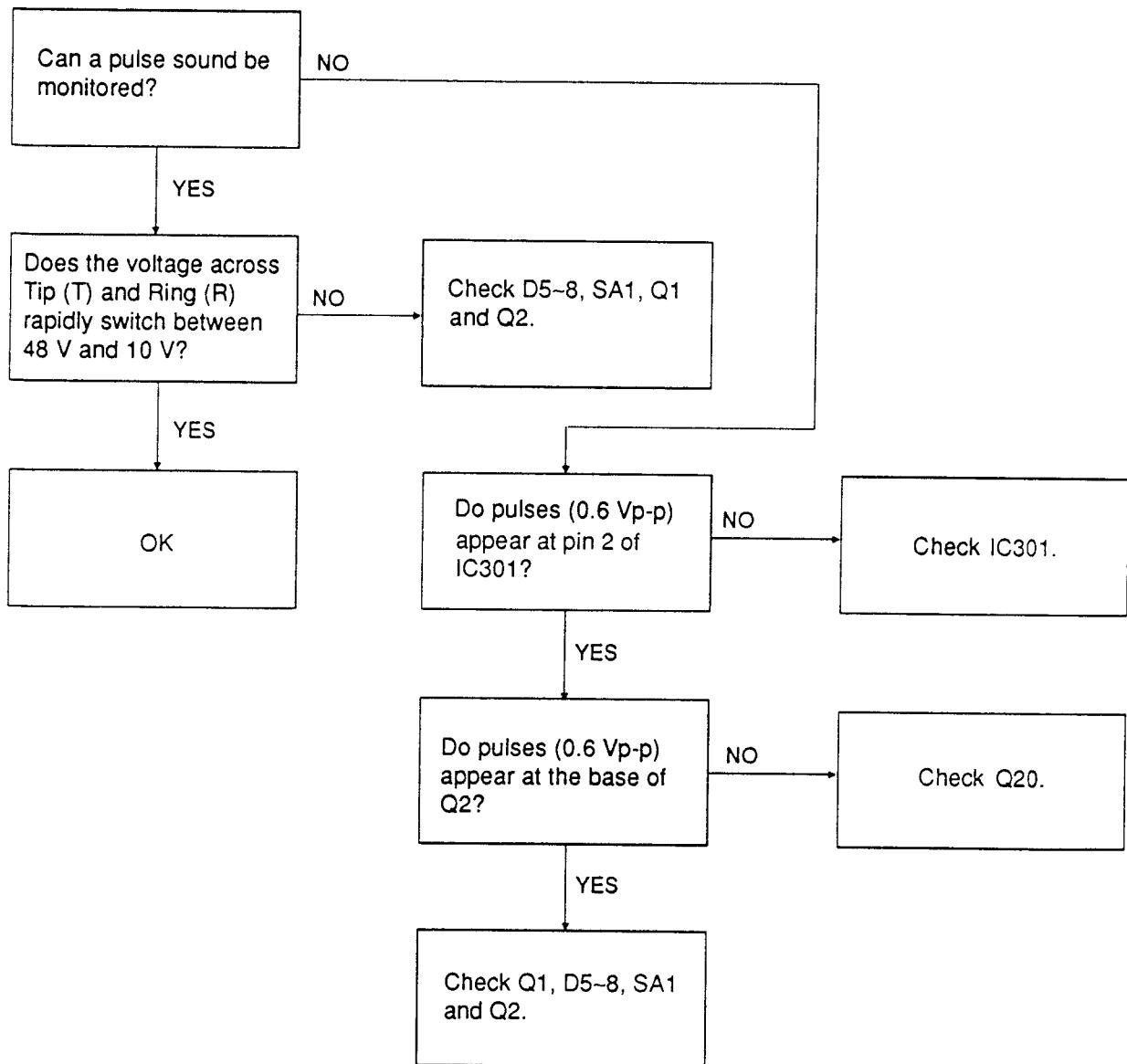




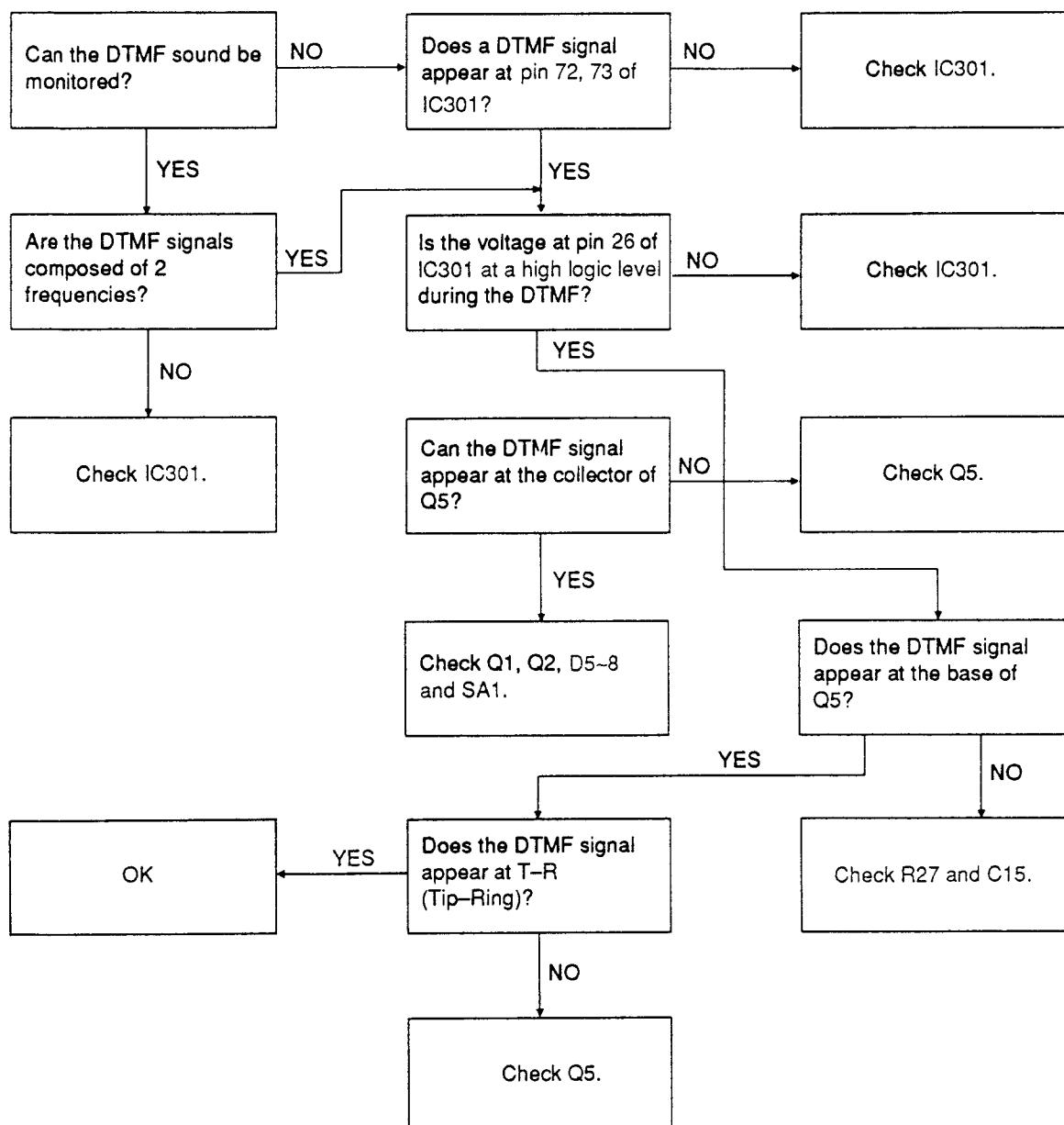
2) PROBLEMS WITH THE HANDSET



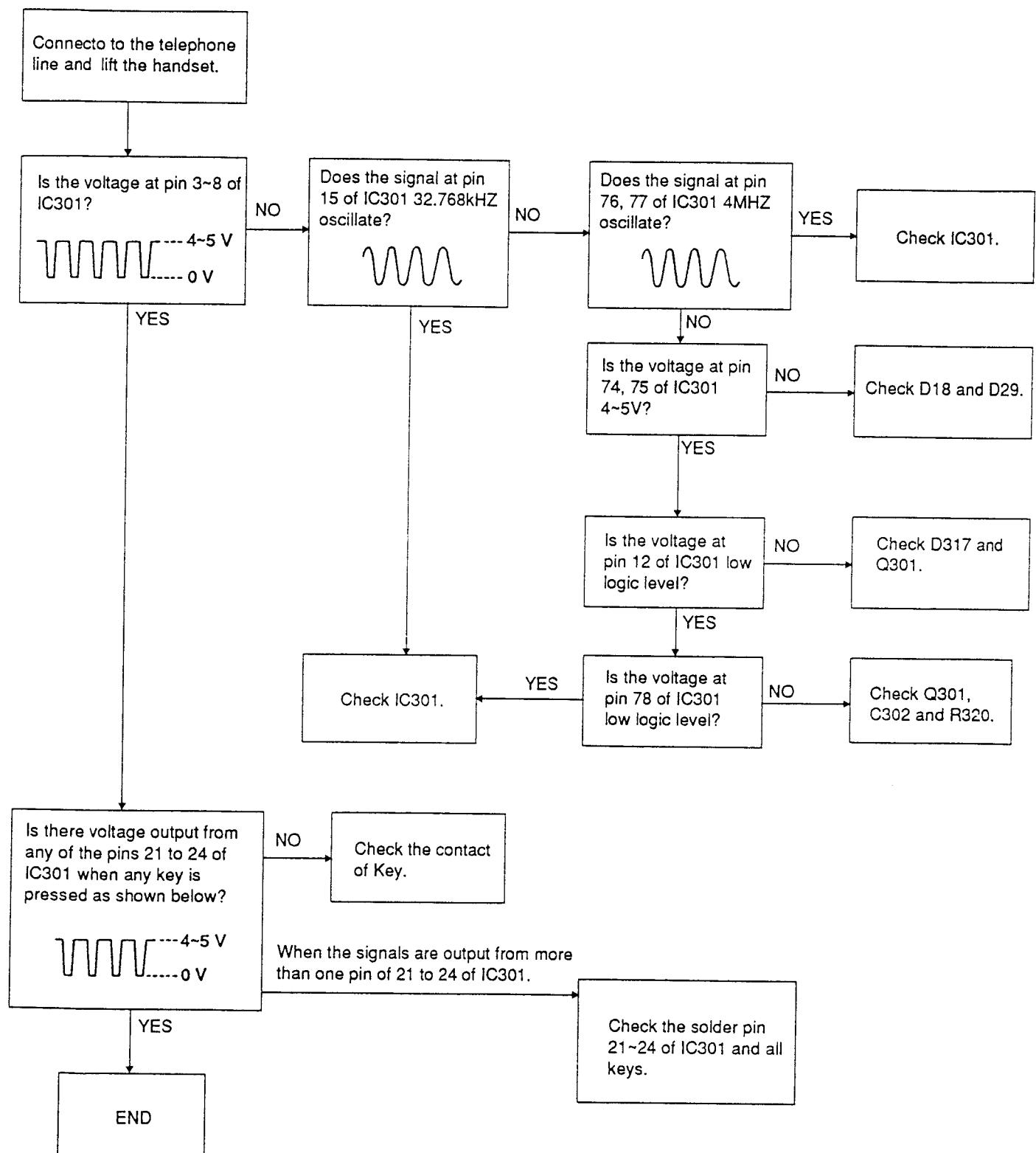
3) PULSE DIALING PROBLEMS



4) TONE DIALING PROBLEMS



5). How to check the IC (IC301)



ACCESSORIES AND PACKING MATERIALS

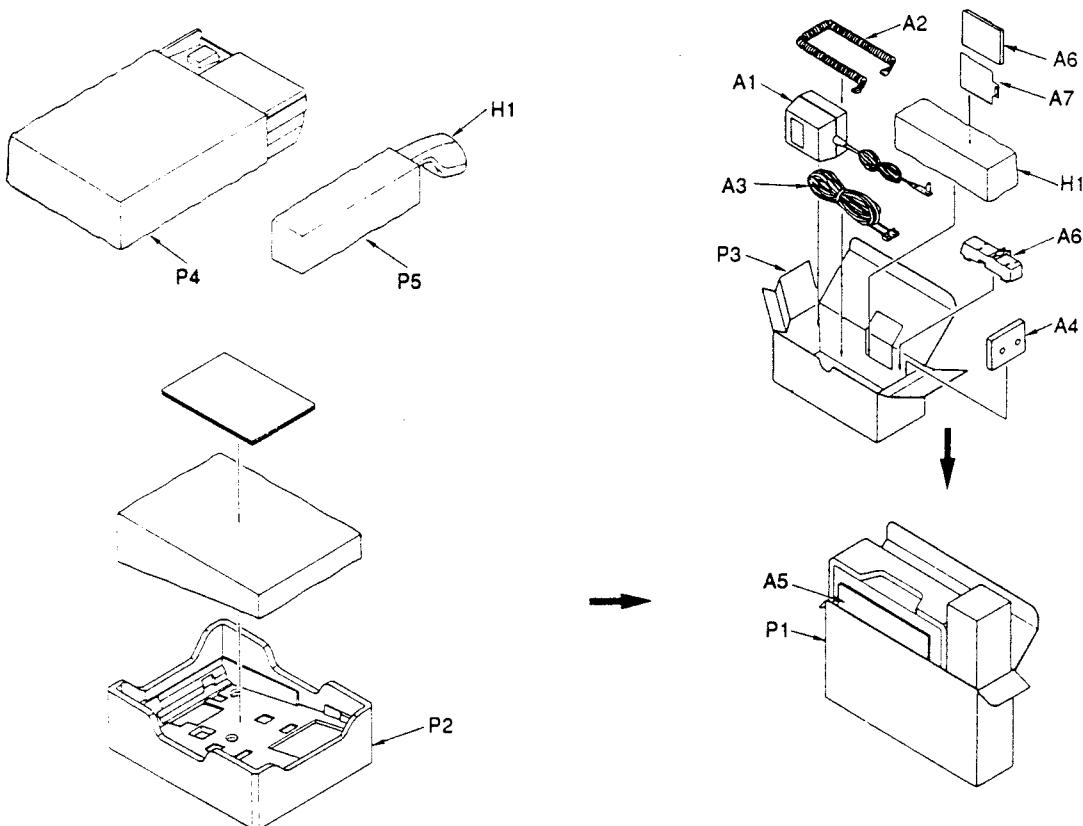
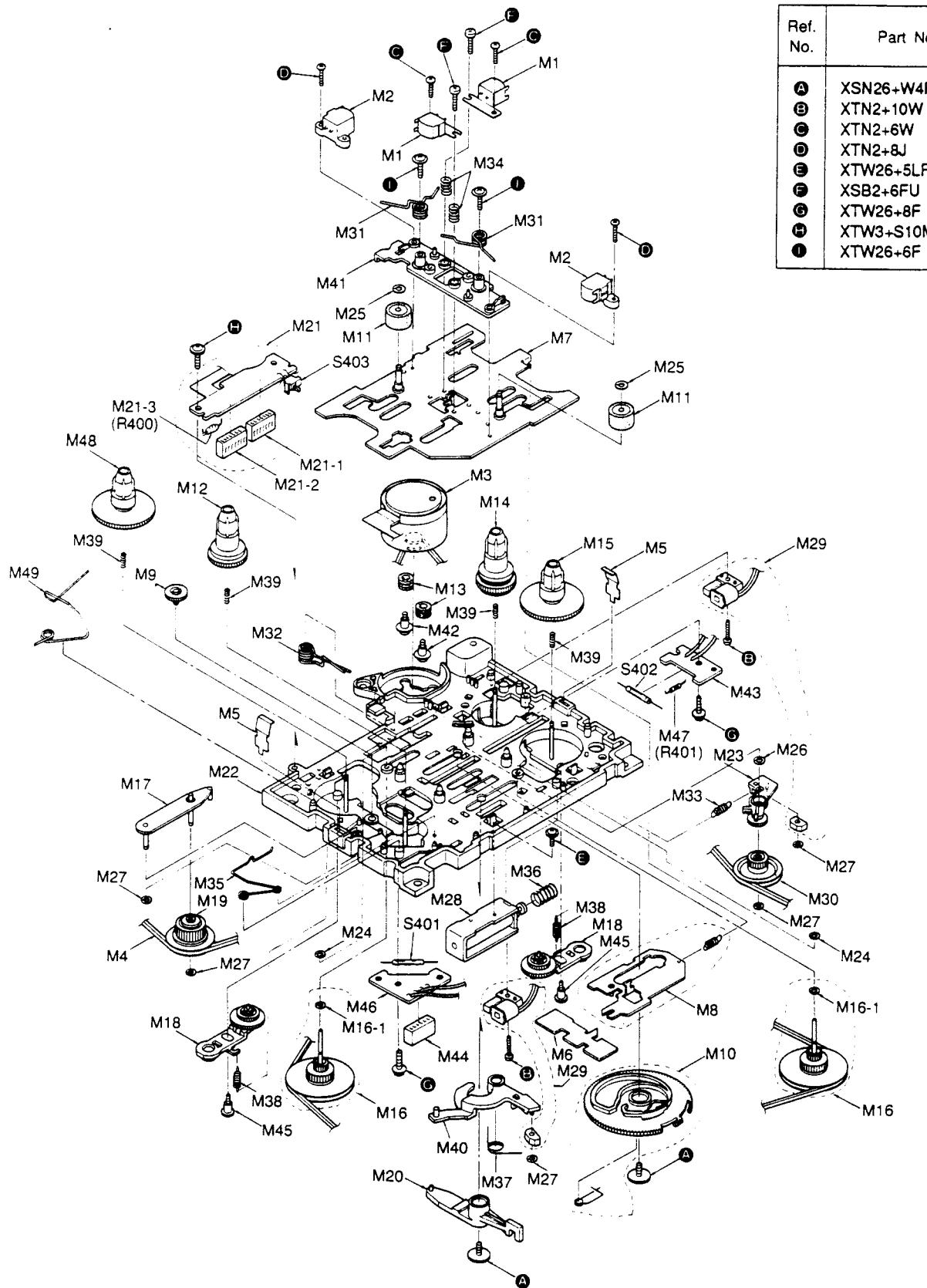


Fig. 14

ACTUAL SIZE OF SCREWS (for DECK)

Ref. No.	Actual size	Part No.	Ref. No.	Actual size	Part No.
A		XSN26+W4FS	F		XSB2+6FU
B		XTN2+10W	G		XTW26+8F
C		XTN2+6W	H		XTW3+S10M
D		XTN2+8J	I		XTW26+6F
E		XSW26+5LF			

MECHANICAL PARTS LOCATION

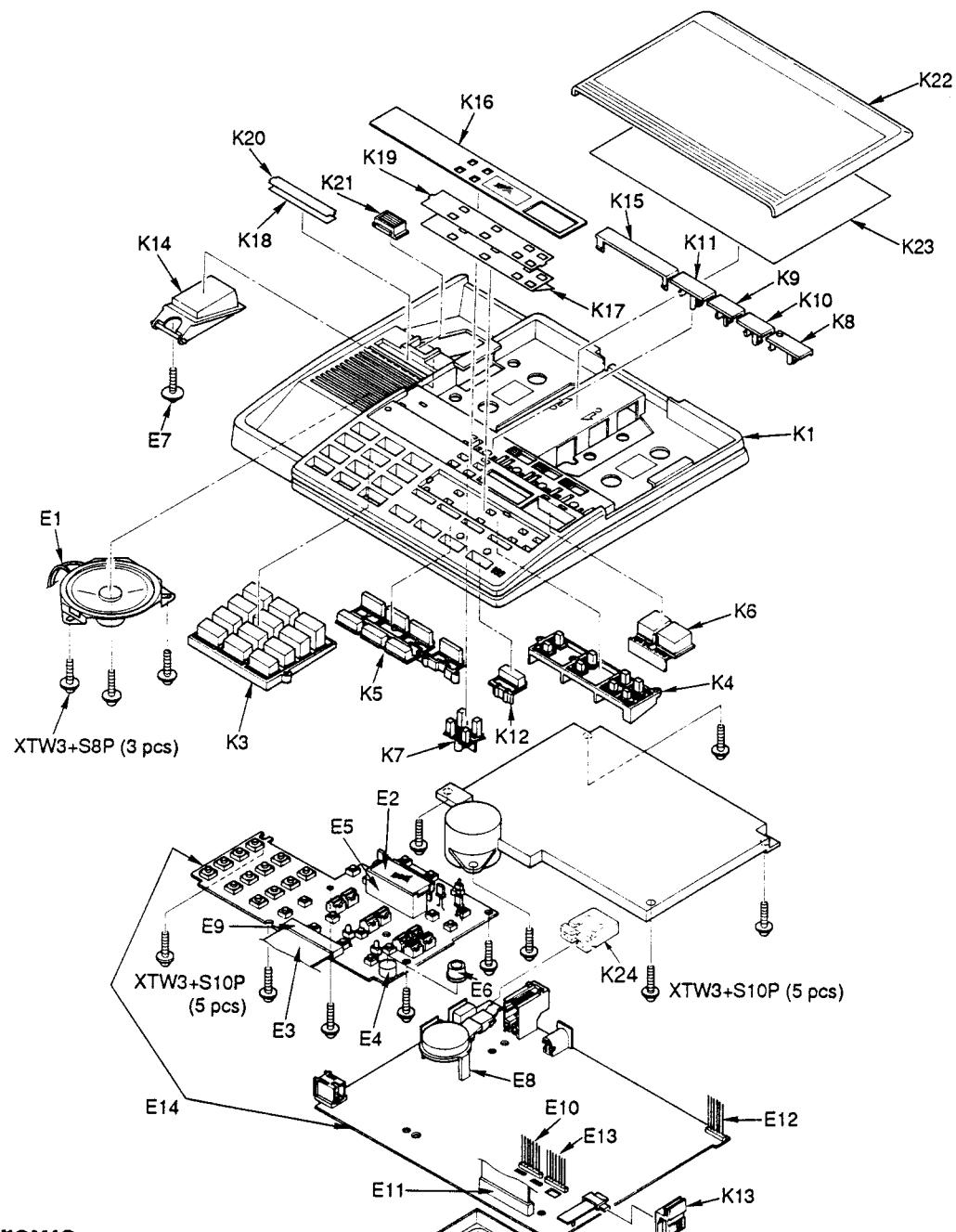


Specifications

Playback torque	35~60 g·cm
Fast forward torque	85~180 g·cm
Rewind torque	85~180 g·cm

Fig. 15

CABINET AND ELECTRICAL PARTS LOCATION



Actual Size of Screws

• For Unit

Autual Size	Part No.
	E7
	XTW3+S10P
	XTW3+S16P

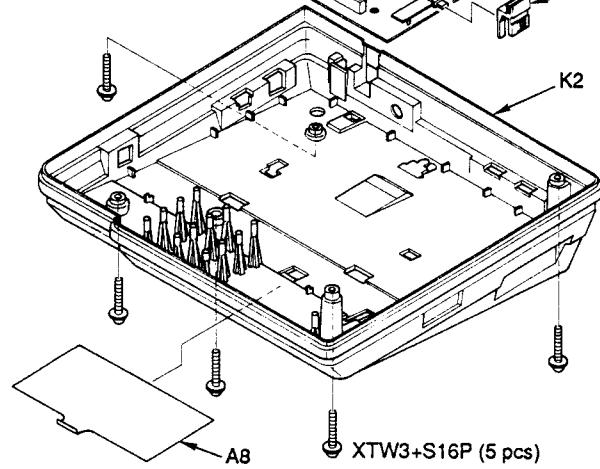


Fig. 15

REPLACEMENT PARTS LIST

Model KX-T2470

Notes:

- Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.
- Important safety notice.**
Components identified by the Δ mark special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.
- The S mark indicates service standard parts and may differ from production parts.
- RESISTORS & CAPACITORS**

Unless otherwise specified.

All resistors are in ohms (Ω) $k=1000\Omega, M=1000k\Omega$ All capacitors are in MICRO FARADS (μF) $P=\mu\mu F$

*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12, 50, S1:1/2W	1:1W	2:2W	3:3W
------------	------------	-----------------	------	------	------

*Type & Voltage of Capacitor

Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCB : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQZ : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		0J:6.3V	1E:25:25V	2A :100V

Ref. No.	Part No.	Part Name & Description	Pcs
M37	PQFS87Z	Spring, Tringer Lever-B	1
M38	PQFS88Z	Spring, Play Arm	2
M39	PQFS90Z	Spring	4
M40	PQFW49Z	Tringer Lever-B	1
M41	PQFW52Z	Head Base	1
M42	PQHD4Z	Screw	2
M43	PQUP71Z	P.C. Board, OGM	1
M44	PQJS6B30Z	Connector (6 Pin)	1
M45	PQHD18Z	Screw	2
M46	PQUP568Z	P.C. Board, ICM	1
M47	PQRD250TJ105	Carbon Film Resistor, 1M Ω	2
(R401)			
M48	PQFR9920Z	Reel Table (Takeup) Assembly	1
M49	PQFS126Z	Spring	1

INTEGRATED CIRCUITS, TRANSISTORS AND DIODES

IC2	PQVI4678A06H	IC	1
IC3	PQVIT8802B24	IC	1
IC4	AN6181K	IC	1
IC5	PQVISC79054A	IC	1
IC6	AN6562	IC	1
IC7	PQVIBA8205	IC	1
IC301	PQV14608A61F	IC	1
Q1	2SA1625	TRANSISTOR(SI)	S 1 Δ
Q2	2SD662B	TRANSISTOR(SI)	S 1 Δ
Q3, 11, 21	2SA933	TRANSISTOR(SI)	S 3
Q4, 7, 9	2SC1740S	TRANSISTOR(SI)	S 8
, 12-15, 19, 20			
Q5	PQVTKSD261CY	TRANSISTOR(SI)	1
Q6	2SD2136	TRANSISTOR(SI)	1
Q8	2SC2120	TRANSISTOR(SI)	1
Q10	2SD1994A	TRANSISTOR(SI)	S 1
Q18	DTC144A	TRANSISTOR(SI)	S 1
Q22	PQVTDTA124E	TRANSISTOR(SI)	1
Q301	2SD1819A	TRANSISTOR(SI)	S 1
Q302	2SB1218A	TRANSISTOR(SI)	S 1
D1-4,11,13, 14, 16-25 ,27-29, 31 , 32, 40,41 , 50-52, 80	1SS119	DIODE(SI)	S 28 Δ
D5-8	PQVDS5688G	DIODE(SI)	S 4 Δ
D9	MA4180	DIODE(SI)	1
D10	MA4300	DIODE(SI)	S 1 Δ
D12	MA4062	DIODE(SI)	S 1
D15	PQVD05AZ6R2	DIODE(SI)	1
D30, 42	I2076	DIODE(SI)	S 2
D60	PQVDMTZ6R8	DIODE(SI)	1
D301	PQVDSLZ255B1	LED	1
D302, 304	PQVDSLZ155B1	LED	2
D303	PQVDSLZ190B1	LED	1
D305, 306	LN221RPH	LED	2
D317	PQVDHZ3BLL	DIODE(SI)	1

JACKS

J1	PQJ1TA9Z	JACK, HANDSET	1
J2	PQJ1TB18Z	JACK, TELEPHONE	1
J3	PQJ1B4Y	JACK, DC IN	1

SWITCHES

S13	PQSS3A17W	SWITCH, RINGER	1
S20	ESE14A211	SWITCH, HOOK	1 Δ
S21	PQSS2A27W	SWITCH, DIALING MODE SELCTOR	1
S101, 102	PQSE17Y	SWITCH, REED (for DECK)	2
S103	PQSH1A17Z	SWITCH, POSITION (for DECK)	1
S301-313	EVQ12405K	SWITCH, OGM PLAY, FF, REW, OGM REC etc	21
, 320, 321			
, 328, 329			

Ref No.	Part No.	Value	Ref No.	Part No.	Value	Ref No.	Part No.	Value	Ref No.	Part No.	Value
R107	PQ4R18XJ334	330K	R176	PQ4R18XJ334	330K	C65	ECEA1HKS4R7	4.7	C119	ECEA0JU332	3300
R108	ERDS2TJ183	18K	R177	Not Used		C66	PQCB0J223MY	0.022	C120	ECEA1HKS0R1	0.1
R109	ERDS2TJ101	100	R178	Not Used		C67	PQCB1C103MY	0.01	C121	PQCB1C103MY	680P
R110	PQ4R18XJ334	330K	R179	PQ4R18XJ124	120K	C68	ECEA0JK221	220	C122	ECEA1HKS010	1
R111	PQ4R18XJ224	220K	R180	PQ4R18XJ122	1.2K	C69	PQCB1C103MY	0.01	C123	ECUV1H104MD	0.1
R112	PQ4R18XJ273	27K	R181	ERDS2TJ562	5.6K	C70	Not Used		C124	PQCB1C152MX	0.0015
R113	ERDS2TJ273	27K				C71	ECEA1HKS010	1	C125	ECUV1H223MD	0.022
			R195	ERDS2TJ682	6.8K	C72	ECEA1CU221	220	C126	ECEA1HKS3R3	33
			R196	PQ4R10XJ152	1.5K	C73	PQCB1C103MY	0.01	C127	Not Used	
R135	PQ4R18XJ684	680K	R197	PQ4R10XJ152	1.5K	C74	PQCB1C103MY	0.01	C128	PQCB1C103MY	0.01
R136	PQ4R18XJ222	2.2K	R198	PQ4R10XJ561	560	C75	ECEA1EU470	47	C129	ECFD1E153KD	0.015
R137	ERDS2TJ223	22K	R199	PQ4R18XJ103	10K	C76	ECEA1HKS3R3	3.3	C130	PQCB1C103MY	0.01
R138	PQ4R18XJ183	18K				C77	PQCB1C103MY	0.01	C131	PQCB1C103MY	0.01
R139	ERDS2TJ273	27K	R250	PQ4R18XJ103	10K	C78	ECEA0JK221	220	C132	Not Used	
R140	Not Used					C79	PQCB1C103MY	0.01	C133	PQCB1C103MY	0.01
R141	ERD25TJ104	100K	R301	PQ4R18XJ224	220K	C80	ECUV1H104MD	0.1	C134	PQCB1C472MX	0.0047
R142	ERDS2TJ104	100K	R302	PQ4R18XJ474	470K	C81	PQCB1H102KB	0.001			
R143	ERDS2TJ473	47K	R303	ERDS2TJ335	3.3M	C82	ECUV1H333JC	0.033	C151	ECFD1E223KD	0.022
R144	Not Used		R304	PQ4R18XJ105	1M	C83	ECUV1H473MD	0.047			
R145	PQ4R18XJ104	100K	R305	PQ4R18XJ334	330K	C84	ECEA1HKS0R1	0.1	C160	PQCB0J223MY	0.022
R146	ERDS2TJ473	47K	R306	PQ4R18XJ224	220K	C85	ECEA0JK221	220	C161	ECEA1EU470	47
R150	ERDS2TJ472	4.7K	R307	PQ4R18XJ104	100K	C86	ECEA0JU102	1000			
R151	ERDS2TJ332	3.3K	R308	PQ4R18XJ333	33K	C87	ECEA1CK101	100	C171	PQCB1H101KB	100P
R152	PQ4R18XJ472	4.7K	R309	PQ4R18XJ272	2.7K	C88	ECEA1EU4R7	4.7	C172	Not Used	
R153	PQ4R18XJ334	330K	R310	PQ4R18XJ272	2.7K	C89	PQCB1H101KB	100P	C173	Not Used	
R154	ERDS2TJ563	56K	R311	PQ4R18XJ104	100K	C90	ECEA0JU220	22	C174	ECFD1C333KD	0.033
R155	Not Used		R312	PQ4R18XJ104	100K	C91	ECEA1HUR47	0.47	C175	Not Used	
R156	Not Used		R313	PQ4R18XJ104	100K	C92	ECUV1H222J	0.0022	C176	ECUV1H223MD	0.022
R157	Not Used		R314	PQ4R18XJ472	4.7K	C93	ECUV1H222J	0.0022	C177	PQCB1C103MY	0.01
R158	ERDS2TJ103	10K	R315	PQ4R18XJ105	1M	C94	ECEA1CKS100	10	C178	ECFD1C104KD	0.1
			R316	Not Used		C95	ECEA1CKS100	10			
R170	ERDS2TJ473	47K	R317	Not Used		C96	PQCB1C103MY	0.01	C188	PQCUV1C683MD	0.068
R171	ERDS2TJ473	47K	R318	PQ4R18XJ104	100K	C97	PQCB1H331KB	330P	C189	PQCUV1E104ZF	0.1
R172	ERDS2TJ104	100K	R319	PQ4R18XJ104	100K	C98	PQCB1C103MY	0.01			
R173	Not Used		R320	PQ4R18XJ104	100K	C99	ECEA1HKS010	1	C200	ECEA1HKS0R1	0.1
R174	PQ4R18XJ334	330K	R338	PQ4R10XJ101	100	C100	PQCB1C103MY	0.01			
R175	PQ4R18XJ334	330K	R339	Not Used		C101	Not Used		C301	ECUV1H472KB	0.0047
			R340	PQ4R10XJ223	22K	C102	Not Used		C302	ECUV1H104MD	0.1
						C103	Not Used		C303	Not Used	
						C104	Not Used		C304	PQCB1H221KB	220P
						C105	EECF5R5H224	0.22	C305	PQCB1H221KB	220P
						C106	Not Used		C306	PQCB1C103MY	0.01
						C107	ECEA0JK221	220	C307	ECEA0JK221	220
						C108	ECEA1HKS010	1	C308	ECUV1H120JC	12P
						C109	ECEA1HKS0R1	0.1	C309	ECUV1H150JC	15P
CAPACITORS											
C1	ECQE2E105KZ	1	C33	ECEA1HKS010	1				C320	ECUV1H103KB	0.01
C2	ECEA1HU100	10	C34	ECFD1C683KD	0.068				C321	ECUV1H103KB	0.01
C3	ECEA1HUR22	0.22	C35	Not Used				C322	ECUV1H103KB	0.01	
C4	ECQM1H822JV	0.0082	C36	Not Used				C330	PQCUV1H222KB	0.0022	
C5	ECFD1E223KD	0.022	C37	Not Used				C340	PQCUV1E104ZF	0.1	
C6	ECKD2H681KB	680P	C38	Not Used							
C7	ECKD2H681KB	680P	C39	Not Used							
C8	ECUV1H473MD	0.047	C40	Not Used							
C9	ECFD1E223KD	0.022	C41	Not Used							
C10	ECEA0JU471	470	C42	Not Used							
C11	ECEA1HU100	10	C43	Not Used							
C12	ECFD1E473KD	0.047	C44	Not Used							
C13	PQCB1C103MY	0.01	C45	Not Used							
C14	Not Used		C46	Not Used							
C15	PQCB0J223MY	0.022	C47	Not Used							
C16	PQCB1C103MY	0.01	C48	Not Used							
C17	ECFD1E223KD	0.022	C49	Not Used							
C18	Not Used		C50	Not Used							
C19	ECFD1E473KD	0.047	C51	Not Used							
C20	ECFD1E473KD	0.047	C52	Not Used							
C21	PQCB1H471KB	470P	C53	Not Used							
C22	ECFD1E473KD	0.047	C54	Not Used							
C23	ECFD1E473KD	0.047	C55	PQCB1C103MY	0.01						
C24	ECKD1H222KB	0.0022	C56	ECFD1E223KD	0.022						
C25	ECEA1HKS0R1	0.1	C57	PQCB1C103MY	0.01						
C26	ECEA0JU102	1000	C58	PQCB1C682KX	0.0068						
C27	ECEA1CK101	100	C59	PQCB1C472MX	0.0047						
C28	ECEA1CKS100	10	C60	ECFD1C104KD	0.1						
C29	PQCB1C103MY	0.01	C61	ECUV1H223MD	0.022						
C30	ECUV1H224ZF	0.22	C62	ECFD1C104KD	0.1						
C31	ECEA1EU4R7	4.7	C63	ECFD1C104KD	0.1						
C32	ECEA1HKS010	1	C64	Not Used							

OPERATIONS

Transferring the ICM

If a telephone number is stored into the transfer station and the unit is set to the transfer mode, each time an ICM is recorded, the unit will automatically dial the number to which the ICM is to be transferred.

Initial programming for transferring ICM

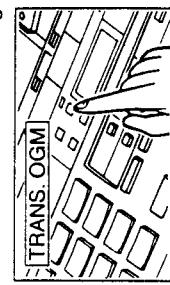
Before storing the telephone number into the transfer memory station, program as follows.

- 1 Press **PROGRAM** **#** **3** **1** **AUTO/STORE** **PROGRAM**

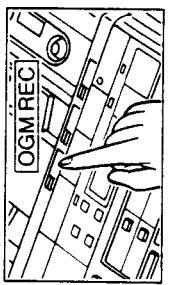
- 2 To transfer the ICM to your desired telephone, store the transferred telephone number into the transfer memory station. (See page 54.)

Recording the transfer OGM

When the called party answers, the unit plays the transfer OGM to inform you that an ICM has been recorded. Before using this ICM transfer feature, record the transfer OGM. Transfer OGM's recording time is limited up to 30 seconds. Make sure the POWER indicator lights.



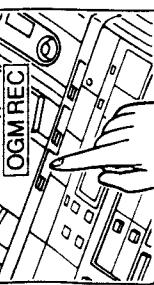
1



2



3



4

Checking your transfer OGM

- 1 Press the TRANS. OGM button.

The TRANSFER indicator flashes at first, then it will switch to a steady light after the unit finishes rewinding the OGM tape.

- 2 Press the OGM PLAY button.

Press the OGM PLAY button again to finish the operation halfway.

Sample of transfer OGM

"Hello. This is Dick Smith. I'm going to visit you today. While I'm away, if somebody calls me, the answering machine will get the messages, so could you tell me if my machine calls you before my arrival? Thank you."

NOTE:

• If the initial programming is set for pager mode (See NOTE on page 55), the transfer OGM is not played back, so the transfer OGM recording is not necessary.

• Speak loudly and clearly right after the beep, about 20 cm (8") away from the microphone (MIC).
Do not pause for over 2 seconds.

If you hear 6 beeps and the announcement "Please record your Outgoing Message again", start over again from step 2 after the unit stops rewinding.

Start speaking at once.

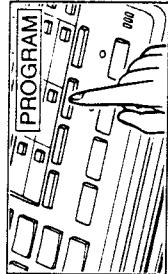
Press the OGM REC button again when you finished recording.

The unit resets the OGM tape, and it will be ready to answer incoming calls.

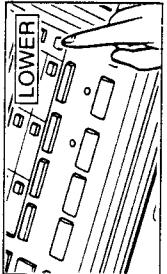
Transferring the ICM (cont.)

Storing the telephone number into the transfer memory station

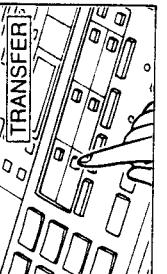
1 Press the PROGRAM button.
The MUTE/STORE indicator lights.



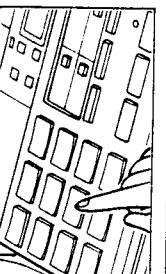
2 Press the LOWER button.
The MUTE/STORE indicator flashes.



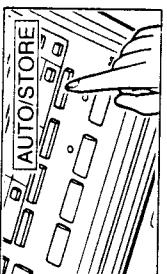
3 Press the TRANSFER button.
The MUTE/STORE indicator goes out.



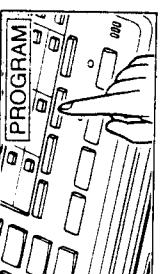
4 Enter the telephone number (up to 30 digits).



5 Press the AUTO/STORE button.
The MUTE/STORE indicator light.



6 Press the PROGRAM button.
The MUTE/STORE indicator goes out.

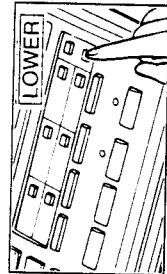


Instead of storing the telephone number into the transfer memory station, you can store a pager's number. See NOTE on page 55.

Setting the transfer mode

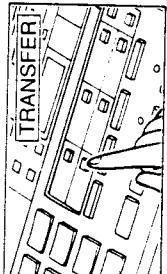
Make sure the transfer number is stored and the POWER indicator lights.

Press the LOWER button.



1

Press the TRANSFER button.

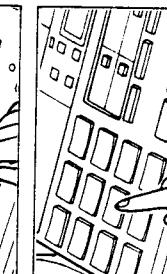


2

The TRANSFER indicator lights.

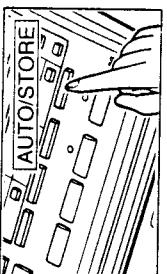
To cancel
Repeat steps 1 and 2. The TRANSFER indicator is off.

3 Press the TRANSFER button.
The MUTE/STORE indicator goes out.



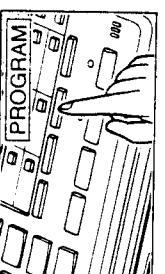
4

5 Press the AUTO/STORE button.
The MUTE/STORE indicator light.



6

6 Press the PROGRAM button.
The MUTE/STORE indicator goes out.



Transferring the ICM (cont.)

Listening to the transferred ICM

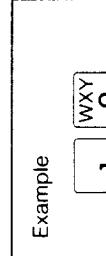
Each time an incoming message is recorded, the unit will automatically dial the phone number to which the Incoming Message is transferred.

1 Lift the handset when the telephone rings.

You will hear your transfer OGM.



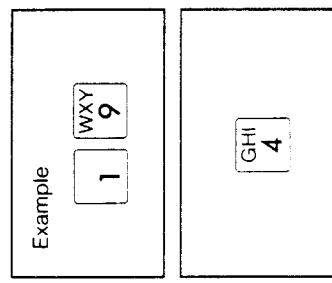
2



Press your code number (for example, 19) while the transfer OGM is playing.

The unit announces the number of newly recorded messages.

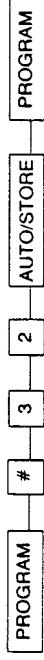
3 Press "4" right after you hear the synthesized voice telling the number of recorded message. ("Memory Playback" will be heard. The unit will play back the newly recorded message at once.)



2

NOTE:

- If you cannot enter your code number during the OGM, hang up. Your KX-T2470 will dial again after 1 minute.
- If the transferred number is busy, the unit will redial up to 15 times within a 10-minute period.
- If no one answers, the line will be terminated after 1 minute. The unit will dial again after 1 minute.
- If you have a pager, you can get a call your pager when an Incoming Message is recorded by programming the pager number into the transfer memory station. Depending on the system of the pager you use, the unit may call the pager several times. In this case, please re-program your unit as follows to eliminate redialing.



Storing a transfer number from a remote phone

If you forget to program the transfer number to which the ICM is to be transferred, the number can be programmed from a remote phone.

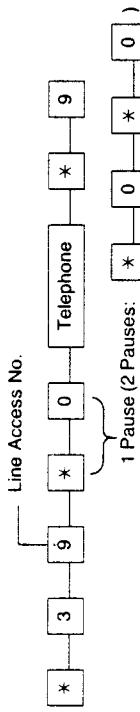
1 Call your unit and press the Code number during the OGM.

2 Press as follows, immediately after you hear the beeps indicating the number of newly recorded messages.

For the unit at home;



For the unit behind PBX system;



To confirm

Repeat storing procedure.

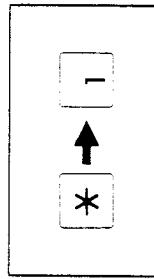
Refer to "Confirming a stored number" on Operating Instruction.

To set the transfer mode immediately after storing the telephone number

Within 10 seconds after storage, press "*" and "1" in sequence.

Setting the transfer mode remotely

You can set or cancel the transfer mode from a remote touch tone phone. After calling your unit and entering the code number during the OGM:



Press "*" right after you hear the announcement indicating the number of the recorded messages, then press "1".

If a telephone number is not stored into the transfer memory station, 6 beeps will be heard. In this case, store the telephone number. (Refer to storing procedure on this page.)

To cancel

Press "2" instead of pressing "1" in the above procedure.

Liquid Crystal Display

Announcement by the Unit

KX-T2470

Display	Description
(Current) (Time) AM 10:30	The POWER ON/OFF button is set to off. (The POWER indicator is off.)
(Tape) Counter 0 25	Outgoing Message is being recorded or played back. Example: "2 5" means 25 seconds elapsed.
(Message) Counter MESSAGE 12	The recording time is set to "1 minute" or "VOX" mode. The display will show the number of recorded messages.
(Call) Counter CALL 18	The recording time is set to "Announce only" mode. The display shows the number of calls received.
(Error) ERR	• The OGM tape is broken or not inserted. • There is more than a 2-second pause while recording the OGM.
(Flashing) AM 12:00	• The AC adaptor has just plugged into the unit at initial use. • When power is restored after a power interruption.
?	When confirming a stored telephone number including "*" with voice memo check.
P	When confirming a stored telephone number including "#PAUSE" with voice memo check.
F	When confirming a stored telephone number including "FLASH" with voice memo check.

Announcement	Description
Number of messages received twelve (12 messages are recorded.)	<ul style="list-style-type: none"> When you press the PLAYBACK/PAUSE button or the NEW MESSAGE button. When you press your remote code number on a remote phone to play back the recorded messages.
End of final message	All the recorded messages have been played back.
End of tape	The ICM tape is full.
Please record your Outgoing Message again	You pause for over 2 seconds while recording your OGM.
Monday seven o'clock AM	Display shows AM 7:00 When you press the TIME DAY CHECK.

- While operating your unit from a remote phone, you can hear the synthesized voice instructions.

Service Manual

and Technical Guide

Telephone Equipment

KX-T2470

KX-T2475

Supplement-1

AUTO-LOGIC™

EASA-PHONE®

Integrated Telephone
Answering System

- Please use this manual together with the Service Manual for model No. KX-T2470, Order No. KM49006227C1.
- Please use this manual together with the Service Manual for model No. KX-T2475, Order No. KM49009267C1.

CHANGES

KX-T2470

Suffix B~D	8HAQB12345	← Serial No. Label
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KX-T2475

Suffix B, D	8HAQB12345	← Serial No. Label
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	Suffix (KX-T2470)	Suffix (KX-T2475)	Reason for suffix change
1	A → B	—	Deck assembly has been changed and the side head base assembly was improved.
2	B → C	A → B	IC3 has been modified to improve the performance of the synthesized voice.
3	C → D	B → D	The main P.C.Board has been changed to comply with the UL regulations.

Suffix	A	B (A)	C (B)	D
IC3 (Synthesized IC)	PQVIT8802B24		PQVIT8802B25	
Main P.C.Board	PQUP873ZA or ZB			PQUP873YA

Note: ()..... Suffix for KX-T2475

Panasonic

KX-T2470/KX-T2475

■ PARTS COMPARISON TABLE

Reason for Change		*The circled item indicates the reason. If no marking, see the Notes in the bottom column.					
1. Improve performance							
2. Change of material or dimension							
3. To meet approved specification							
4. Standardization							
5. Addition							
6. Deletion							
7. Correction							
8. Other							

Interchangeability Code **The circled item indicates the interchangeability. If no marking, see the Notes in the bottom column.

Parts	Set Production						
A Original New	→→ Early	Original or new parts may be used in early or late production set.					
	→ Late	Use original parts until exhausted, then stock new parts.					
B Original New	→→ Early	Original parts may be used in early production sets only. New parts may be					
	→ Late	used in early or production sets. Use original parts where possible, then stock new parts.					
C Original New	→→ Early	New parts only may be used in early or late production sets.					
	→ Late	Stock new parts.					
D Original New	→ Early	Original parts may be used in early production sets only. New parts may be used in late					
	→ Late	production sets only. Stock both original and new parts.					
E Other							

Ref. No.	Part No.	Part Name & Description	Pcs/Set	Remarks	Note 1	Note 2	Time of Change [Suffix]
	Original Part No.	New Parts No.					

[KX-T2470/KX-T2475]

MECHANICAL PARTS

M1	PQJH1E6Z	PQJH1E8Z	R/P Head	2		3*	3D	D
M2	PQJH6E4Z	PQJH6E7Z	Erase Head	2		3*	3D	D
M21	PQFZ9910Z	PQFZ9918Z	Flexible P.C. Board Assembly	1		3*	3D	D
M21-3	PQRDS2TJ563	-----	Carbon Film Resistor, 56kΩ	0	Deletion	3*	6	D
M43	PQUP717Z	PQUP963Z	P.C. Board, OGM	1		3*	3B	D
M46	PQUP568Z	PQUP962Z	P.C. Board, ICM	1		3*	3B	D
M50	-----	PQHR322Z	Isulator	2	Addition	3*	5	D

TRANSISTORS AND DIODE

Q221, 222	-----	2SD1819A	Transistor(Si)	2	Addition	3*	6	D
D28	1SS119	-----	Diode (Si)	0	Deletion	5*	5	Mid of D

CABINET PART

K23	PQQT5147Z	PQQT5177Z	Instruction Sheet	1			1 A	Mid of D
-----	-----------	-----------	-------------------	---	--	--	-----	----------

ELECTRICAL PART

E14	PQWPT2470M	PQWPT2470M1	P. C. Board Assembly (NLA)	1		3*	3 B	D
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SWITCHES

S316~318 , 324~326 , 332~334 , 340~342	PQSH1A33Z	PQSH1A43Z	Switch, Dialing	12			7	—
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OTHERS

SA1	PQVDSAE310F1	PQVDDSV301LA	Varistor	1		3*	3 B	D
F1	-----	PQBA1P02NMAL	Fuse (125V, 200mA)	1	Addition	3*	6	D

ACCESSORIES

A2	PQJA59Y	PQJA59V	Telephone Cord	1		3*	3 B	D
A3	PQJA30M	PQJA212M	Handset Cord	1		3*	3 B	D

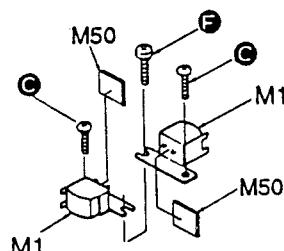
RESISTORS

R14	ERDS1TJ470	ERDFS1TJ470	Resistor, 47Ω	1		3*	3D	D
R99	PQ4R1XJ222	PQ4R10XJ222	Resistor, 2.2kΩ	1			7	—
R158	ERDS2TJ03	PQ4R10XJ103	Resistor, 10kΩ	1		3*	3D	D
R176	PQ4R18XJ334	PQ4R10XJ334	Resistor, 330kΩ	1		3*	3D	D
R196	PQ4R10XJ152	-----	Resistor, 1.5kΩ	0	Deletion	3*	6	D
R197	PQ4R10XJ152	-----	Resistor, 1.5kΩ	0	Deletion	3*	6	D
R198	PQ4R10XJ561	-----	Resistor, 560Ω	0	Deletion	4*	6	Mid of D
R221	-----	PQ4R10XJ473	Resistor, 47kΩ	1	Addition	3*	5	D
R222	-----	PQ4R10XJ103	Resistor, 10kΩ	1	Addition	3*	5	D
R223	-----	PQ4R10XJ473	Resistor, 47kΩ	1	Addition	3*	5	D
R224	-----	PQ4R10XJ103	Resistor, 10kΩ	1	Addition	3*	5	D
R901	-----	ERDFS1TJ474	Resistor, 470kΩ	1	Addition	3*	5	D

Ref. No.	Part No.		Part Name & Description	Pcs/Set	Remarks	Note 1	Note 2	Time of Change[Suffix]
	Original Part No.	New Parts No.						
CAPACITORS								
C9	ECFD1E223KD	PQCB0J223MY	Capacitor, 0.022μF	1		3*	3D	D
C10	ECEA0JU471	ECEA1AU221	Capacitor, 220μF	1		2*	1D	Mid of D
C26	ECEA0JU102	ECEA0JU331	Capacitor, 330μF	1		2*	1D	Mid of D
C30	ECUV1H224ZF	-----	Capacitor, 0.22μF	0	Deletion	5*	6	Mid of D
C65	ECEA1HKS4R7	ECEA1EU4R7	Capacitor, 4.7μF	1		5*	1D	Mid of D
C86	ECEA0JU102	ECEA0JK221	Capacitor, 220μF	1		1*	1D	Mid of A
C105	EECF5R5H224	EECS5R5V224	Capacitor, 0.22μF	1		5*	1D	Mid of D
C119	ECEA0JU102	ECEA1AU222	Capacitor, 2200μF	1		4*	1D	Mid of D
C174	ECFD1C333KD	ECUV1H333JC	Capacitor, 0.033μF	1		3*	3D	D
C178	ECFD1C104KD	ECUV1H104MD	Capacitor, 0.1μF	1		3*	3D	D
C200	ECEA1HKS0R1	ECEA1HUR33	Capacitor, 0.33μF	1		5*	1D	Mid of D
C901	-----	ECKTAE103ZF	Capacitor, 0.01μF	1	Addition	3*	5	D
[KX-T2470]								
MECHANICAL PARTS								
M7	PQFD9914Z	PQFD9914Y	Operation Plate	1			1A	Mid of A
M32	PQFS117Z	PQFS117Y	Spring	1			1A	Mid of A
ICS								
IC2	PQVI4678A06H	PQVI4678A07H	IC	1			1B	Mid of A
IC3	PQVIT8802B24	PQVIT8802B25	IC	1			1B	C(B)
IC4	AN6181K	AN6181NK	IC	1		1*	1D	Mid of A
CABINET PARTS								
K2	PQYF1047W7	PQYF1047S7	Lower Cabinet Assembly	1		3*	3B	D
K16	PQGP117Z	PQGP117Y	Panel	1			1A	Mid of A
[KX-T2475]								
CABINET PART								
K2	PQYF1047U71	PQYF1047R71	Lower Cabinet Assembly	1		3*	3B	D

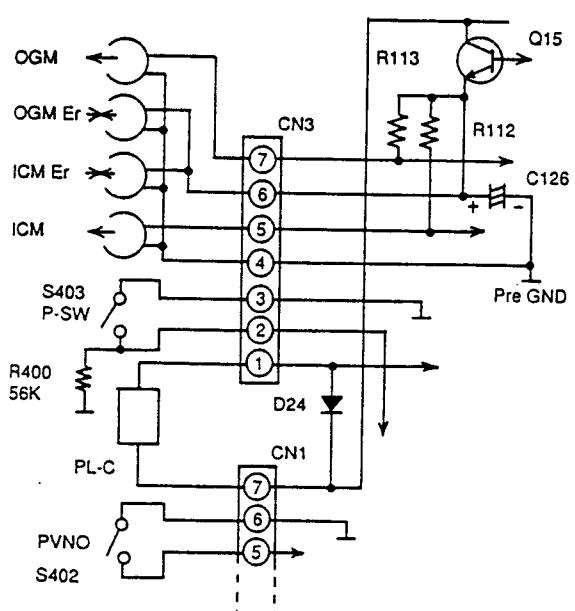
Notes: 1. Part with mark 1* has been changed at the same time. (Aug. 1990)
 2. Part with mark 2* has been changed at the same time. (Sep. 1990)
 3. Part with mark 3* has been changed at the same time. (Oct. 1990)
 4. Part with mark 4* has been changed at the same time. (Jan. 1991)
 5. Part with mark 5* has been changed at the same time. (Feb. 1991)
 6. ()...Suffix for KX-T2475.

■ MECHANICAL PARTS LOCATION (Page 48)

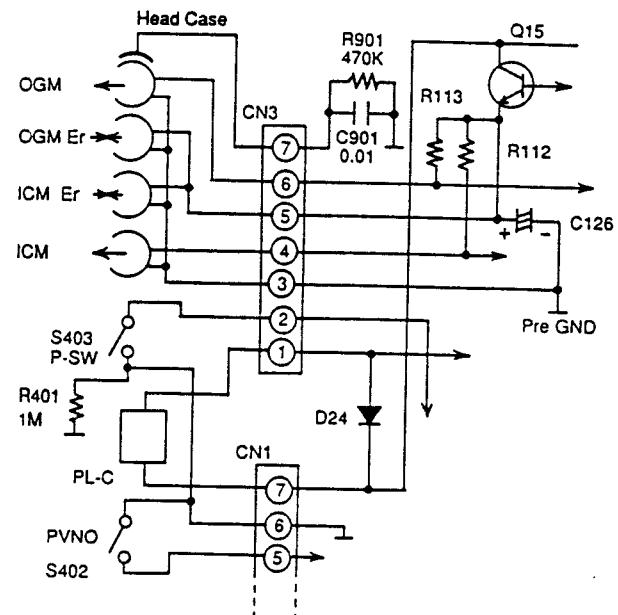


(Supplement-1)

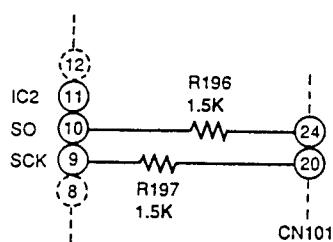
■ SCHEMATIC DIAGRAM (Pages 12-14)



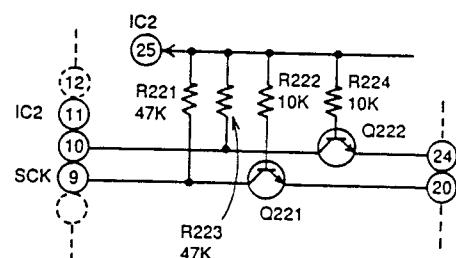
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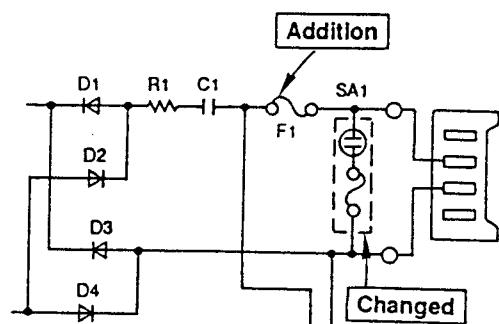
(Supplement-1)



(Original)



(Supplement-1)



(Supplement-1)